

# NIH COVID-19 Report on Extramural Research

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*Office of the Director*  
*Scientific Workforce Diversity*

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# Executive Summary

This initial phase of analysis focuses on the impact of COVID-19 on the **career trajectory outlook, productivity and perceived institutional support, and mental health and other external stressors** of extramural researchers. The key takeaways are summarized below.



## Career Trajectory

- ▶ The **majority of respondents (55%)** said that the pandemic would **negatively impact their career trajectory**; only **14%** said it would not
- ▶ Among research types, **laboratory-based researchers (61%)** were the most likely to agree that the pandemic will negatively affect their career trajectory
- ▶ The **strongest predictor** of a researcher's negative outlook toward their career trajectory was their **ability to apply for grants**
- ▶ **75%** of the variation in a demographic group's anticipated career trajectory can be explained by the **percentage of laboratory-based researchers** within that group



## Productivity & Institutional Support

- ▶ Since the pandemic began, most (**78%**) reported **lower levels of productivity**, while less than a quarter (**22%**) reported no change or higher levels of productivity
- ▶ Most early- (**80%**) and mid- (**81%**) career investigators reported lower levels of productivity since the pandemic began, with **faculty members more likely** to report that their **productivity had fallen** than those in **researcher roles**
- ▶ **Changes in laboratory access and ability to apply for grants** were strong predictors of **lower research productivity**
- ▶ **Higher levels of institutional support** correspond to a **smaller percentage of respondents citing lower productivity**



## Mental Health & External Stressors

- ▶ **Over two-thirds** of respondents cited **societal/political events and physical/social isolation** as negatively impacting their mental health, significantly above other factors
- ▶ **Early-career investigators** were consistently **more negatively impacted** than mid-career and senior-career investigators across top factors affecting mental health
- ▶ Among **caretakers**, those providing care for **children under 5 were most likely to report that the pandemic harmed their career trajectory and research productivity**
- ▶ **Civil unrest tied to racism** negatively affected research productivity at the greatest rate for **bisexual and Black or African American respondents**

# Overview

## Survey Overview

To gauge the impact of COVID-19 on the extramural research community, NIH developed two online surveys that were fielded in October 2020:

- 1) **Extramural Institutions Survey** to understand challenges faced by research leaders at top NIH-funded institutions during the pandemic
- 2) **Extramural Researchers Survey** to understand how COVID-19 has impacted researchers at NIH-funded institutions

The questionnaires were developed by the **Coronavirus Survey Development Group** and spearheaded by the **Chief Officer for Scientific Workforce Diversity (COSWD)**. All surveys were fielded on the Qualtrics survey platform.

## Methodology

### Researchers Survey

<b>Sample Selection</b>	Researchers at domestic institutions who met both of the following criteria: <ul style="list-style-type: none"><li>• Have logged onto the eRA Commons system in the past two years</li><li>• Were in a Scientific Role: Principal Investigators, Trainees, Sponsors, Undergraduate Students, Graduate Students, Postdocs, Scientists, and Project Personnel</li></ul>
<b>Total Participants</b>	<b>45,348</b> out of 234,254 invites
<b>Response Rate</b>	<b>19%</b>
<b>Fielding Timeline</b>	October 14, 2020 – November 13, 2020

### Institutions Survey

<b>Sample Selection</b>	A single research leader (VP for Research or equivalent) from each of the following institutions: <ul style="list-style-type: none"><li>• Top-funded 1,000 domestic institutions per FY2019 NIH awards</li><li>• Members of the Association of American Medical Colleges (AAMC)</li><li>• Minority-serving institutions that received FY2019 NIH awards</li></ul>
<b>Total Participants</b>	<b>224</b> out of 705 invites
<b>Response Rate</b>	<b>32%</b>
<b>Fielding Timeline</b>	October 7, 2020 – November 6, 2020

**Note:** Missing data and N/A responses are excluded from the percentages shown throughout the analysis. Only percentages with more than 5 respondents are shown to protect privacy.

If you are interested in the analytical methods used, please refer to the [appendix section here](#).

# Questionnaire Development

A three-phased approach was used to develop the survey instruments, allowing for multiple rounds of reviews and adjustments based on feedback from target survey participants.

	Questionnaire Development	Cognitive Testing	Pilot Testing	Survey Launch
Description	<ul style="list-style-type: none"> <li>The questionnaires were developed by the Coronavirus Survey Development Group and spearheaded by the Chief Officer for Scientific Workforce Diversity</li> <li>During weekly touchpoints, the survey instruments were drafted, discussed, and refined, in accordance with overall objectives</li> </ul>	<ul style="list-style-type: none"> <li>Cognitive testing was conducted on the draft survey instruments to gather participant feedback and make necessary adjustments</li> <li>One-on-one phone interviews lasting 60 minutes were conducted with <b>9 researchers</b> (5 principal investigators and 4 trainees) for the COVID-19 Impact on Extramural Researchers Survey and <b>9 research leaders</b> at top NIH-funded institutions for the COVID-19 Impact on Extramural Institutions Survey</li> <li>Confidential feedback was gathered and shared with the Survey Development Group to make necessary adjustments to the survey instrument</li> </ul>	<ul style="list-style-type: none"> <li>Pilot Testing was then conducted to identify questions that may cause confusion or misinterpretation</li> <li>Survey invites were sent to: <ul style="list-style-type: none"> <li>Researchers Survey: 150 randomly selected participants</li> <li>Institutions Survey: 12 research leaders</li> </ul> </li> <li>The piloted surveys included additional questions to gather participant feedback on specific sections of the survey and the overall survey-taking experience</li> <li>Information from the feedback questions was gathered and shared with the Survey Development Group to make final adjustments to the survey instruments</li> </ul>	
Timeline – Researchers Survey	5/21/2020 – 10/9/2020	8/6/2020 – 9/3/2020	9/22/2020 – 10/2/2020	
Timeline – Institutions Survey	5/21/2020 – 10/5/2020	8/25/2020 – 9/3/2020	9/22/2020 – 10/1/2020	

# Extramural Researchers Survey

# Professional Demographics

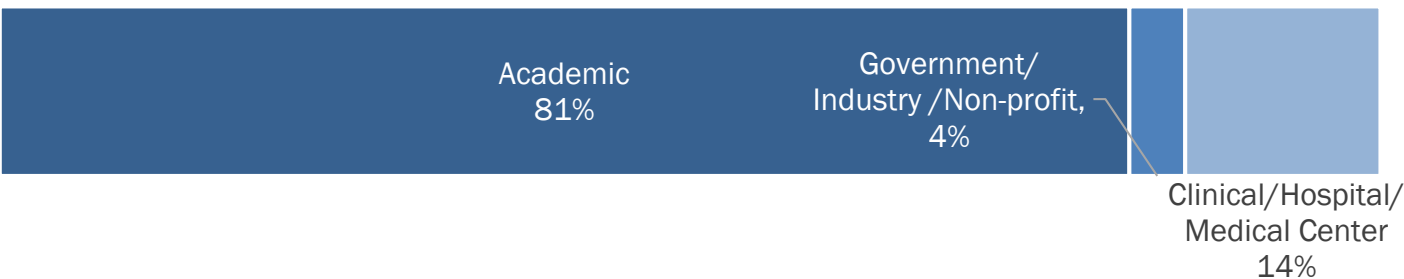
Of all respondents, 65% identified as laboratory-based researchers, and 81% conducted research at academic institutions. 47% were principal investigators, and the most common field of study was biological sciences at 38%.

**Type of Research (Q7)**

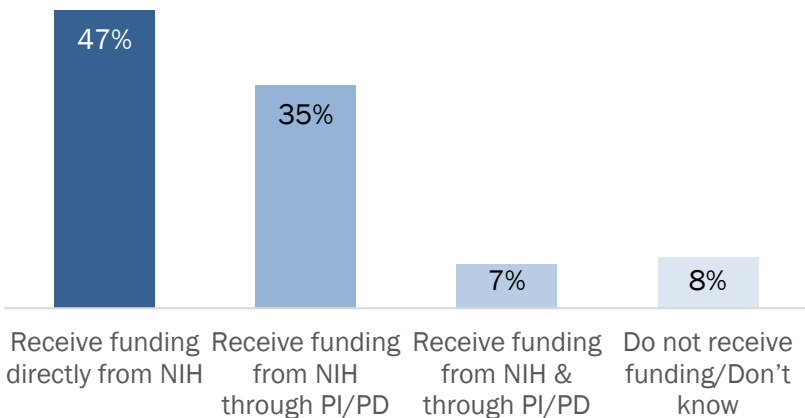


- 65% Laboratory-based research
- 24% Clinical research
- 14% Epidemiological/public health research
- 13% Computational research
- 8% Sociological/community-based research

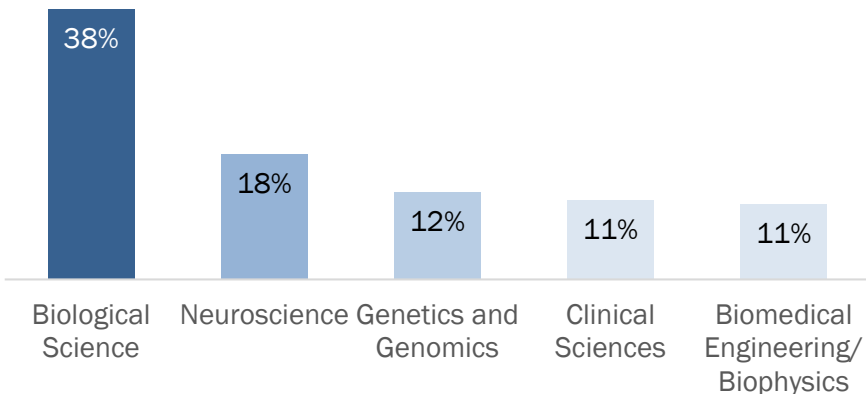
**Type of Institution (Q4)**



**Research Funding Source (Q1)**

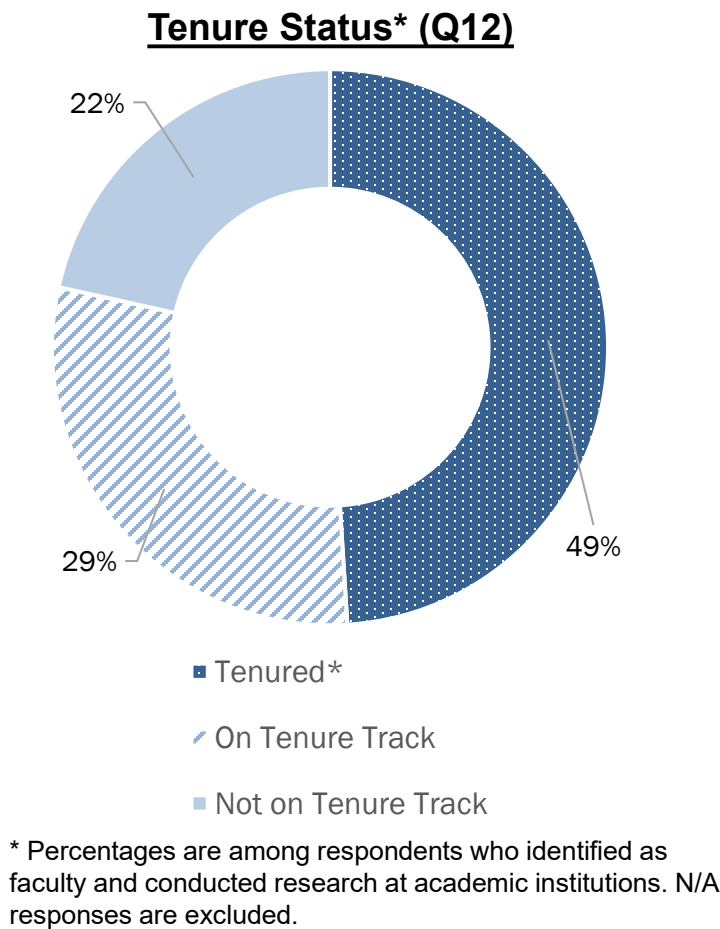
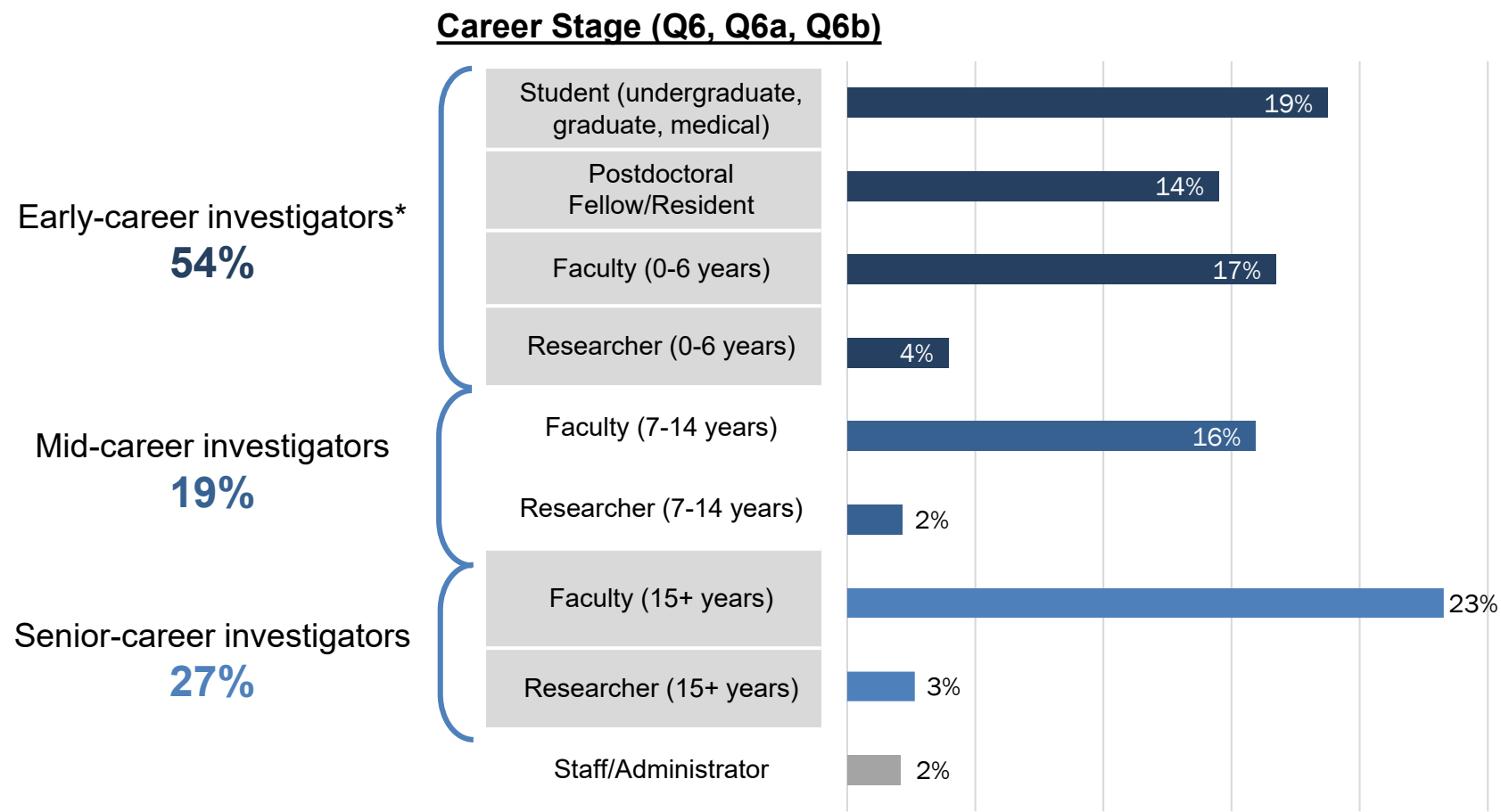


**Top 4 Fields of Study (Q13)**



# Professional Demographics

Of all respondents, over half (54%) identified as early-career investigators, residents, or non-graduate students. Among faculty at academic institutions, nearly half (49%) of the respondents were tenured.



\*The “Early-Career Investigator” category as used in this analysis includes graduate students, postdoctoral fellows, faculty zero to six years after residency or postdoctoral fellowship, and researchers zero to six years after residency, postdoctoral fellowship, or last advanced degree.



# General Demographics

Over two-thirds of all respondents identified as White, 22% identified as Asian, and 4% identified as Black or African American. In addition, 4% of respondents reported having a disability.

## Sexual Orientation (Q98)

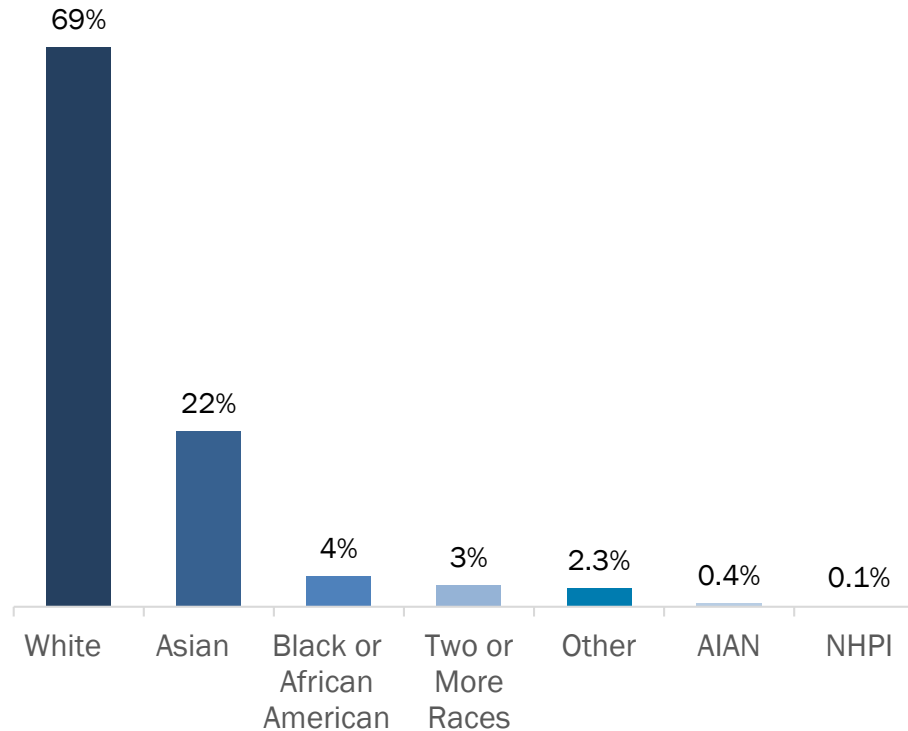
**4%** Of respondents identified as lesbian, gay, or homosexual

**4%** Of respondents identified as bisexual

**1%** Of respondents identified as "other"\*

\* The "other" category includes asexual, questioning, and something else.

## Race (Q96)



\***AIAN** = Alaska Native/American Indian, **NHPI** = Native Hawaiian/Pacific Islander; all percentages are out of valid totals, with missing values removed.

## Disability Status (Q100)

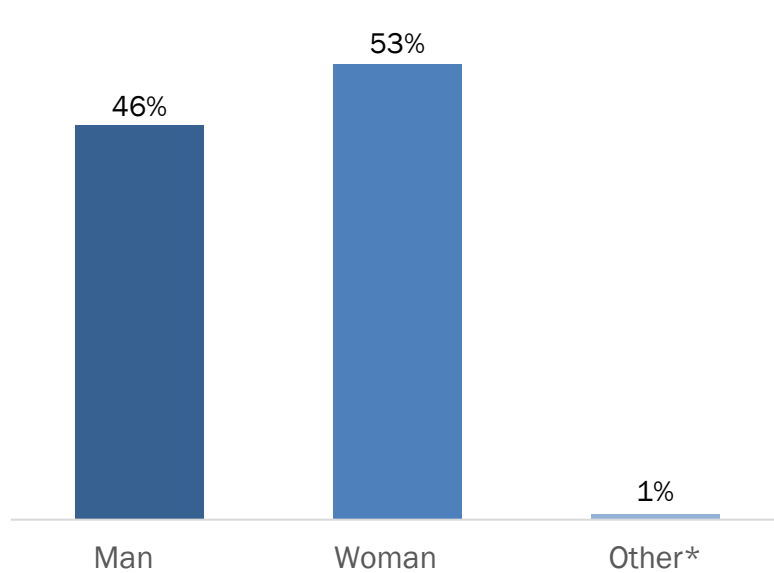
**4%** Of respondents identified as having a disability

**4%** Of respondents preferred not to disclose their disability status

# General Demographics

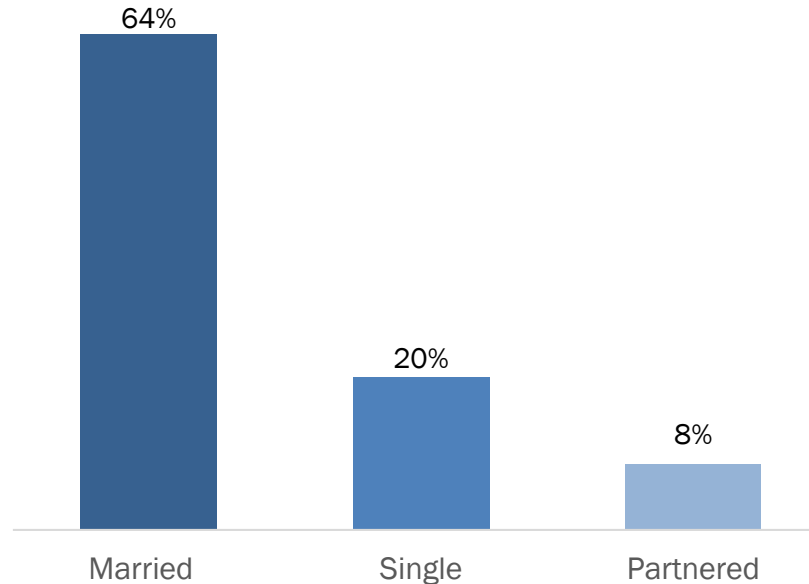
Over 50% of respondents indicated that they were women, and 46% indicated that they were men. In addition, 9% identified as Hispanic, Latino, or of Spanish origin, which is lower than the percentage of Hispanics among US adults (18%).<sup>1</sup>

**Gender Identity (Q97)**

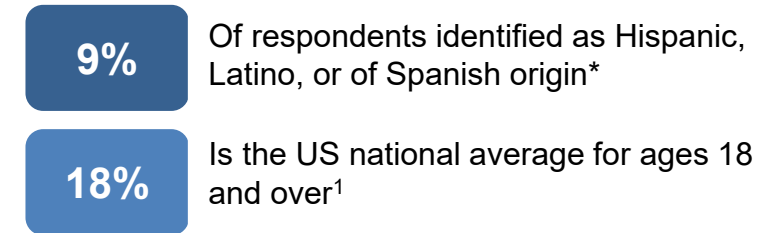


\* The “other” category includes transgender man, transgender woman, genderqueer or gender non-conforming, questioning, and something else. “Prefer not to answer” responses are excluded.

**Marital Status - Top 3 Groups (Q99)**



**Ethnicity (Q95)**

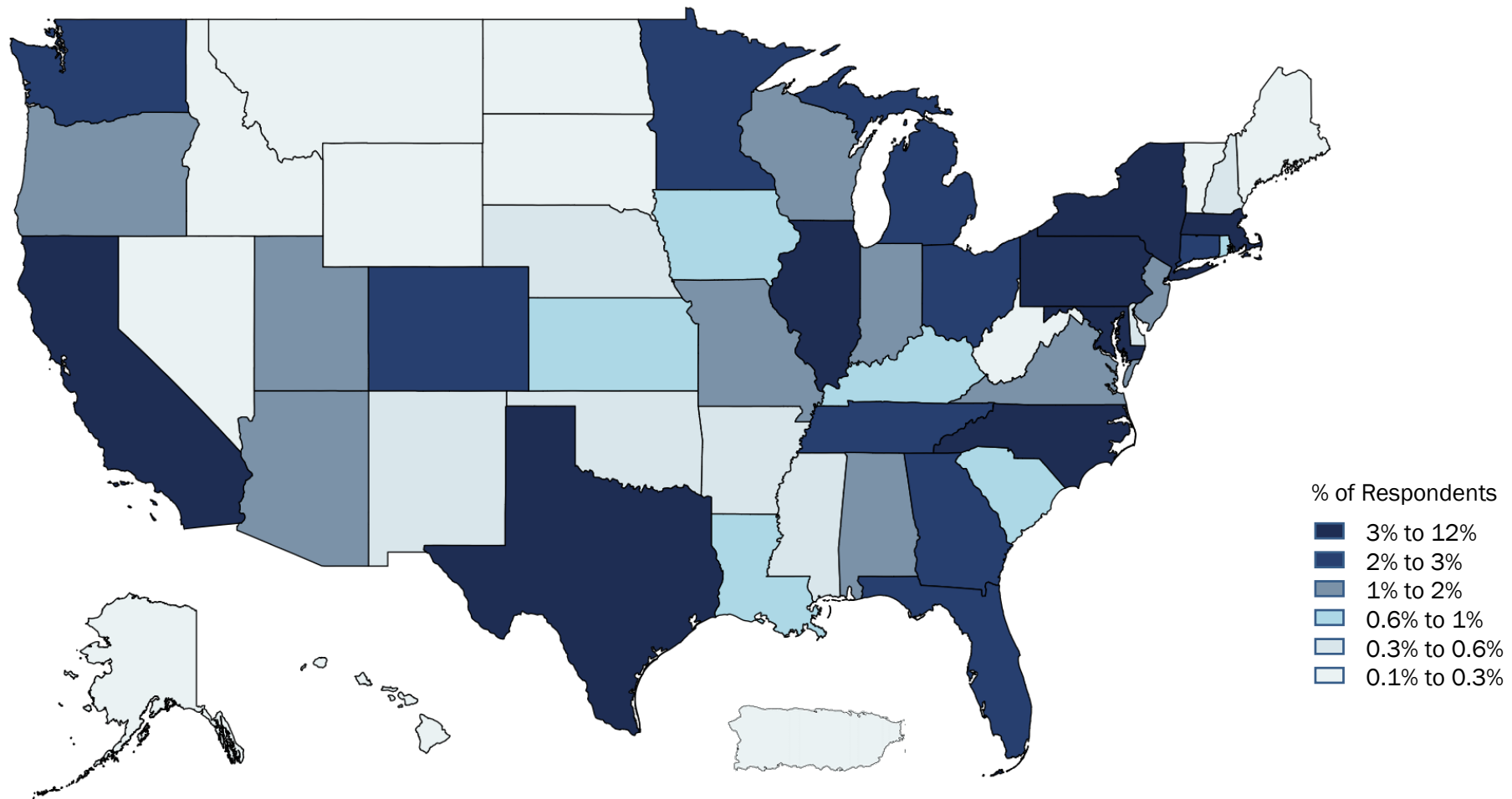


\* “Prefer not to answer” responses are excluded.

<sup>1</sup>Source: U.S. Census Bureau (2017). ACS 1-Year Estimates Data. Retrieved from <https://data.census.gov/cedsci/table?q=United%20States&t=Hispanic%20or%20Latino&q=0100000US&tid=ACSDP1Y2017.DP05>

# General Demographics – Geographic Distribution

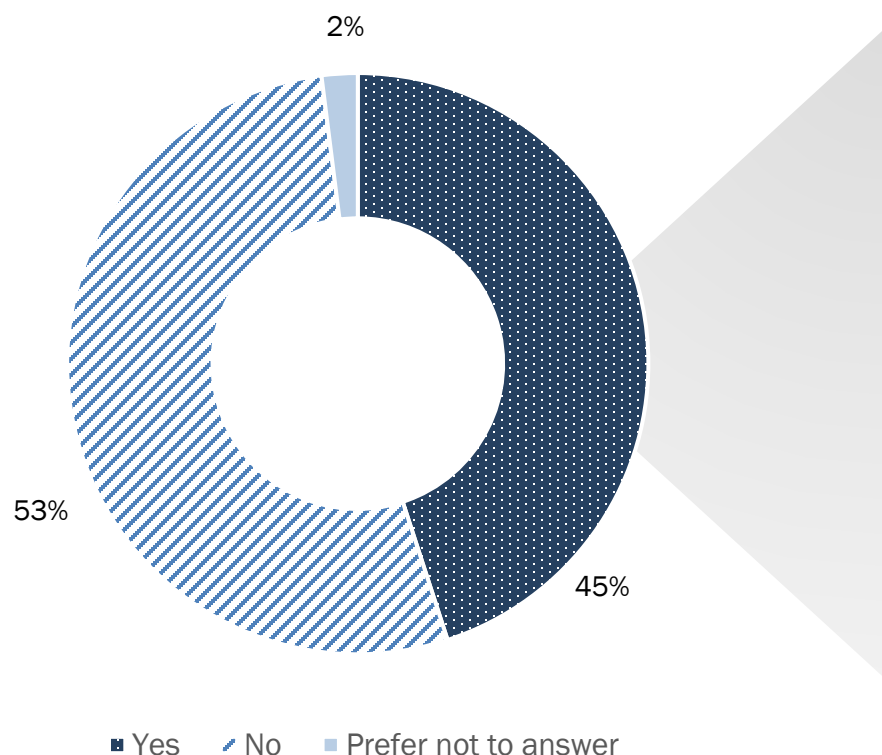
The majority of respondents (50%) were affiliated with institutions in California, New York, Massachusetts, Texas, Pennsylvania, North Carolina, Illinois, or Maryland.



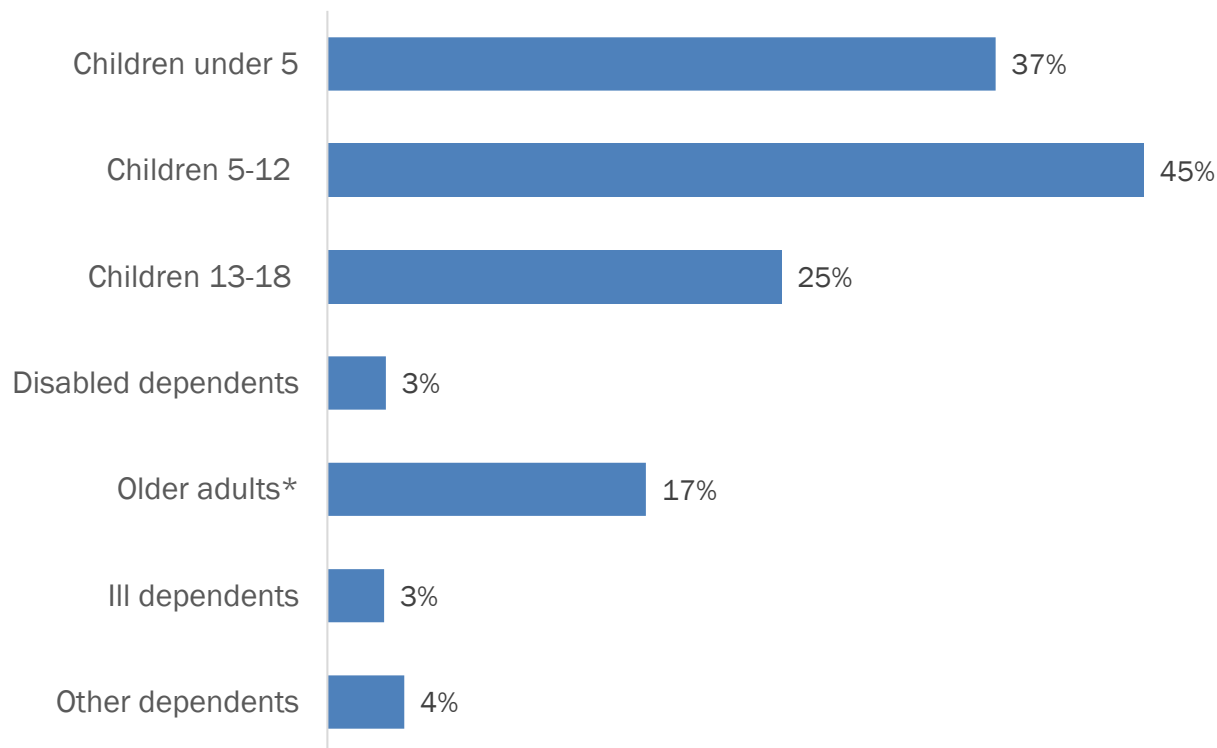
# Caretaking Status

45% of respondents indicated having caretaking responsibilities for individuals in and/or outside their household. Most respondents with caretaking responsibilities indicated that they provide care for children age 5-12 (45%) or children under 5 (37%).

**Caretaking Status (Q16)**



**Who Caretakers Provide Care for...**



\*The survey instrument used the option “elderly individuals,” but the term “older adults” will be used throughout this report.

The percentages for the answer choices reflect the percentage out of the total number of respondents, for that question, who pick that specific answer choice. The sum of the percentages for the answer choices typically exceeds 100%.

# High-Level Findings – Extramural Researchers Survey

The table below presents **responses by key groups** to questions on the **professional and personal impact** of the pandemic.

Proportion Reporting...						
Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
All Respondents	55%	78%	69%	42%	46%	44%
Race/Ethnicity White (69%)	53%	78%	75%	43%	48%	41%
Asian (22%)	65%*	78%	56%+	35%	41%+	51%
Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

**Note:** For certain dependent variables, higher percentages correspond to a more negative impact, whereas for other dependent variables, higher percentages correspond to a less negative impact.

**AA** = African American, **AIAN** = Alaska Native/American Indian, **NHPI** = Native Hawaiian/Pacific Islander

All percentages are out of valid totals, with missing values removed.

\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

On par with Overall Average

## Section 2: Impact of the Pandemic on Career Trajectory

Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
All Respondents	55%	78%	69%	42%	46%	44%
Race/Ethnicity White (69%)	53%	78%	75%	43%	48%	41%
Asian (22%)	65%*	78%	56%+	35%	41%+	51%
Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

On par with Overall Average

# Impact on Career Trajectory by Race and Gender

Of all race groups, **Asian researchers** were the **most likely** to anticipate a negative career trajectory.

**% Negative Impact by Race and Gender**

Race by Gender	% Impacted
Asian, Men	67%
Asian, Other Gender	64%
Asian, Women	62%
White, Other Gender	61%
Two or More Races, All Genders	59%
<b>All Respondents</b>	55%
AIAN, Women	41%
African American, Men	40%
African American, Women	39%
NHPI, Men	31%
African American, Other Gender	22%

The table (Q50 by Q96 and Q97) above presents demographic groups that deviate substantially from the average percentage of respondents reporting that the pandemic will negatively impact their career trajectory.

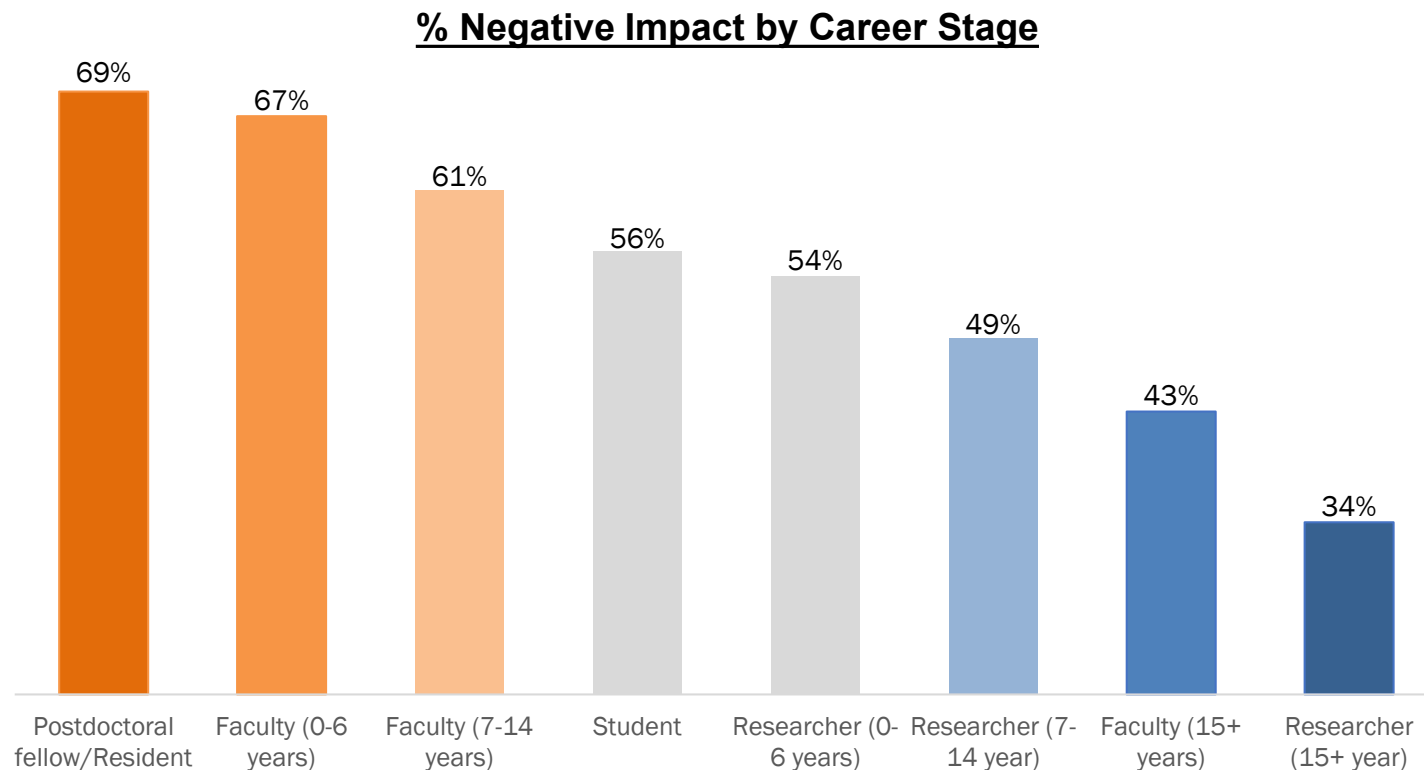
## **Key Finding**

Asian researchers, across all genders, were more likely than average to anticipate a negative impact on their career trajectory due to the pandemic (**above 62% vs 55% overall**). On the other hand, Black or African American researchers were less likely than average to perceive a negative impact on their career trajectory (**below 40%**).

Underlying reasons for these findings are further analyzed on slide 19.

# Impact on Career Trajectory by Career Stage

Across career stages, **postdoctoral fellows/residents and non-senior faculty** were most likely to state that the **pandemic will negatively impact their career trajectory**.



## **Key Finding**

Early- and mid-career investigators were significantly more likely to anticipate a negative impact on their career trajectory than senior-career investigators.

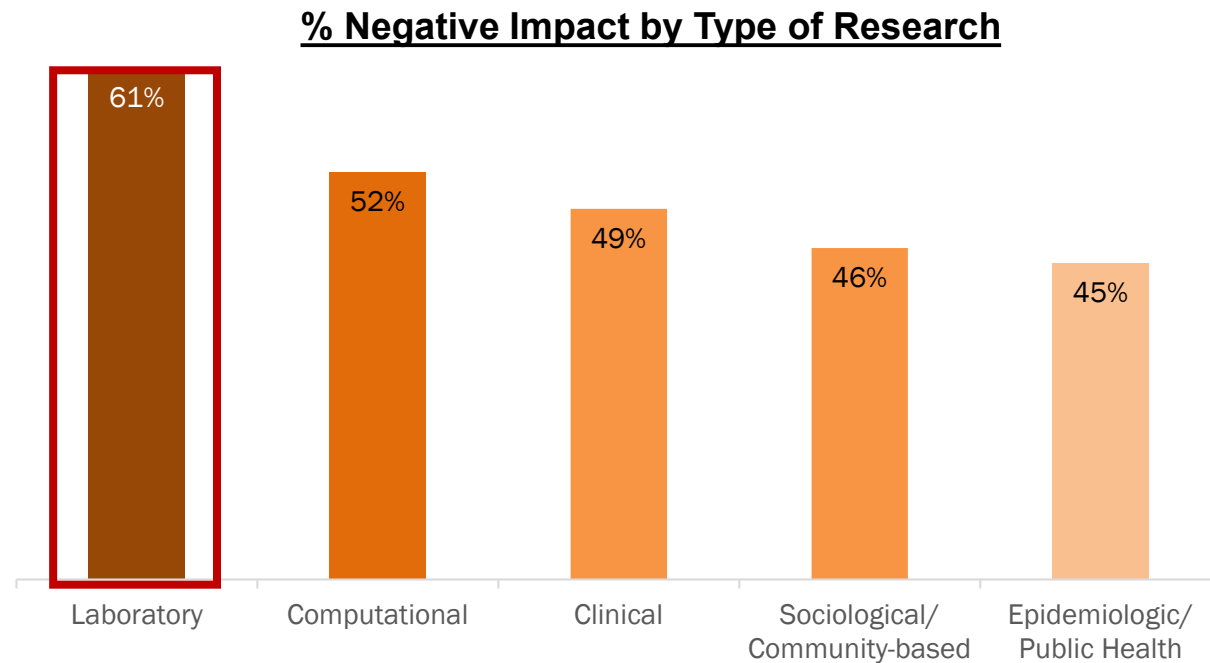
**Faculty at each career stage were more likely than researchers** to perceive a negative impact on their career trajectory.

**The chart (Q6-6b)** above ranks career stages by the percentage of respondents reporting that the pandemic will negatively affect their career trajectory.



# Impact on Career Trajectory by Type of Research

Laboratory-based researchers were more likely than other types of researchers to state that the **pandemic will negatively impact their career trajectory**.



**The chart (Q7)** above ranks type of research by percentage of respondents reporting that the pandemic will negatively affect their career trajectory.

## **Key Finding**

**Laboratory-based and computational researchers** were the most likely to anticipate a negative career trajectory compared to other researcher types (**above 50% vs below 50%**).

Upon further analysis, we found that **74% of laboratory-based researchers identified as Asian**, who only make up 22% of the total respondent population.

# Impact on Career Trajectory by Caretaking Status

Caretakers were **more likely** than non-caretakers to anticipate a negative career trajectory.

Impact by Caretaking Status

Caretaking Status	Respondent Count	% Negatively Impacted	% Early- & Mid-Career
Caretakers	20,973	61%	69%
Non-caretakers	24,687	50%	63%
Preferred not to answer	918	63%	63%

The table (Q16) above lists the respondent count by caretaking status and the percent that selected agree/strongly agree that the pandemic will negatively affect their career trajectory.

Key Finding

Caretakers were **more likely** (61%) than non-caretakers (50%) to anticipate a negative career trajectory.

Upon further analysis, we found the **proportion of early & mid-career investigators is higher among caretakers than among non-caretakers** (75% vs 71%), which may be a factor contributing to a more negative outlook on career trajectory for caretakers.

Additionally, **39% of “prefer not to answer” respondents were Asian, compared to 22% of Asian respondents overall**, which may be a factor contributing to the more negative outlook among those who did not provide their caretaking status.

# Impact of Type of Research by Race and Ethnicity

Much of the **variation in anticipated career trajectory by racial and ethnic group is associated with the type of research respondents conduct**, with the proportion of respondents engaged in laboratory-based research strongly correlated to the percentage anticipating a negative career trajectory.

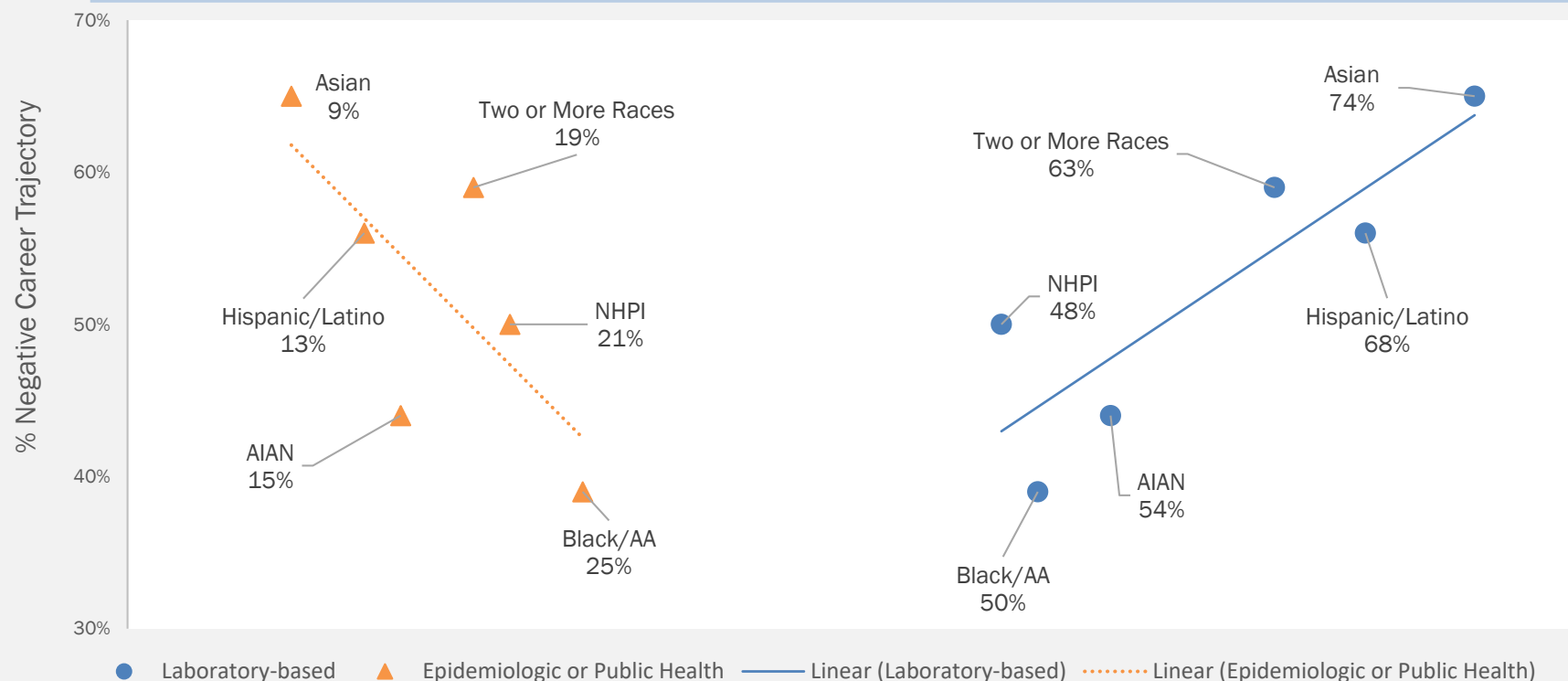
## Key Finding

The relationship between the **percentage of a group conducting laboratory-based research** and the percentage anticipating **harm to their career trajectory** was strong and accounts for **75%** of the variation in responses.

This relationship is **inverted** for the percentage of a group conducting **epidemiologic or public health research**, and this type of research accounts for **52%** of variation in responses.

## % Negative Impact on Career Trajectory by Race, Ethnicity, & Type of Research

**Note:** The percentages below represent the degree to which a race group conducts a specific type of research. For example, “Asian 74%” with a blue data point can be interpreted as **74% of Asian respondents conduct laboratory-based research**.

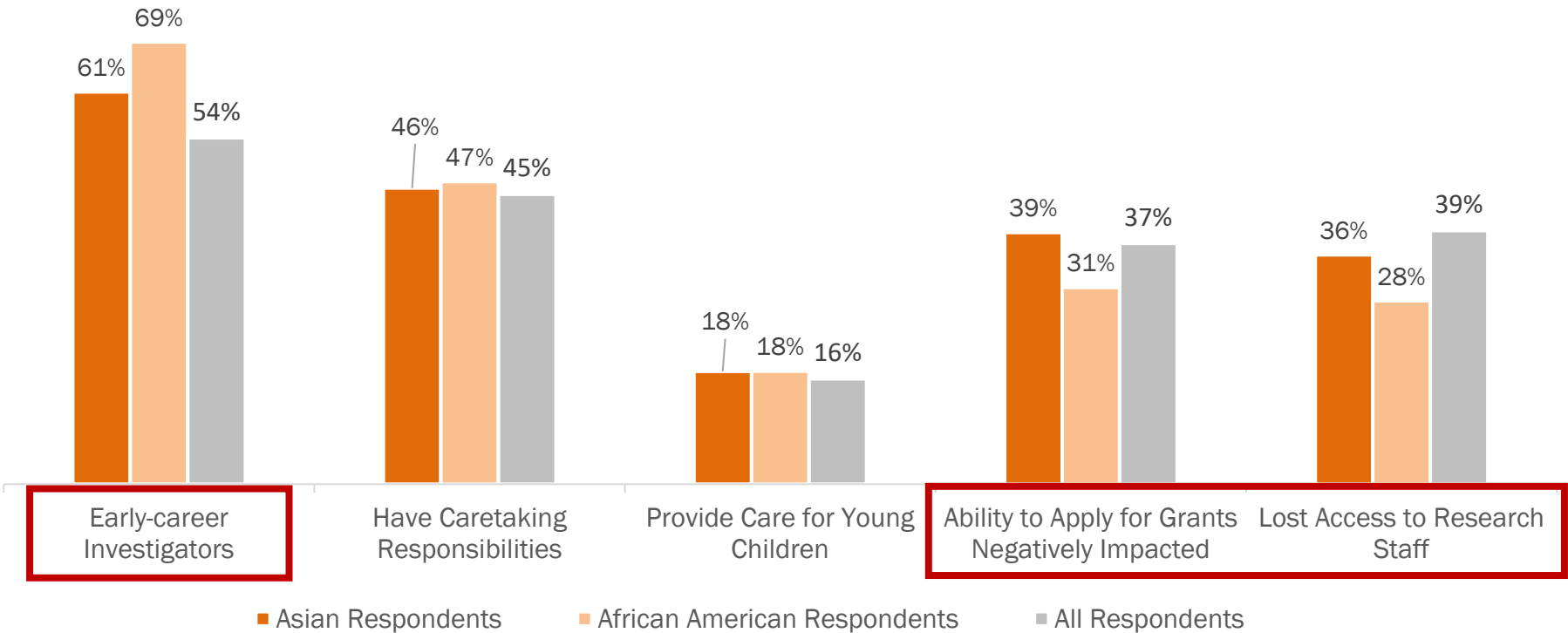


\*AA = African American, AIAN = Alaska Native/American Indian, NHPI = Native Hawaiian/Pacific Islander  
All percentages are out of valid totals, with missing values removed

# Impact on Career Trajectory by Race and Ethnicity

**69% of Black or African American respondents and 61% of Asian respondents identified as early-career investigators**, compared to 54% overall. **31% of African American respondents cited negative impacts on their ability to apply for grants**, compared to 37% overall.

Key Characteristics by Race



Key Findings

The percentage of Black or African American respondents citing **negatively impacted ability to apply for grants** and **loss of access to research staff** was significantly below the average rate.

The percentage of **early-career investigators among Asian respondents** was **significantly higher** than average (69% vs 54%), which may have contributed to their overall negative outlook towards career trajectory.

The chart (Q6-6b, Q16, Q17, Q47, Q24) above lists key factors affecting outlook on career trajectory for Asian and Black or African American respondents compared to the overall average.

# Impact on Career Trajectory – Qualitative Feedback

Respondents who anticipated a negative impact to their career trajectory were asked the following open-ended question: **In what ways do you think the pandemic will negatively impact your career?**

An analysis of the **19,575 responses** revealed four major themes.\*



\*The natural language processing software, WordStat, was used to identify the most common themes in responses to Q50a. The percent values associated with each theme represent the prevalence of a theme across all write-in comments (comments may be associated with one or multiple themes).

# Impact on Career Trajectory – Modifying Variables

The **ability to apply for grants** and COVID-19 **negatively impacting research-related activities** were the most important predictors of an anticipated negative career trajectory, per the generalized boosted model.

Top 10 Variables	Importance
Q47. Impact on Grant Application Ability	41.3
Q28. COVID-19 Negatively Impacting Research-Related Activities	13.5
Q6, 6a, 6b. Career Stage	8.6
Q96. Race	4.9
Q20. Caretaking Impact on Difficulty to Complete Work	3.5
Q7/Q8. Primary Type of Research	2.8
Q26. Negative Impact on Productivity: Personal Mental/Physical Health Negatively Impacting Productivity	2.3
Q59. Organization is Effectively Managing the Impact of COVID-19	2.2
Q24. Lost Access to Expertise	2.0
Q99. Marital Status	1.8

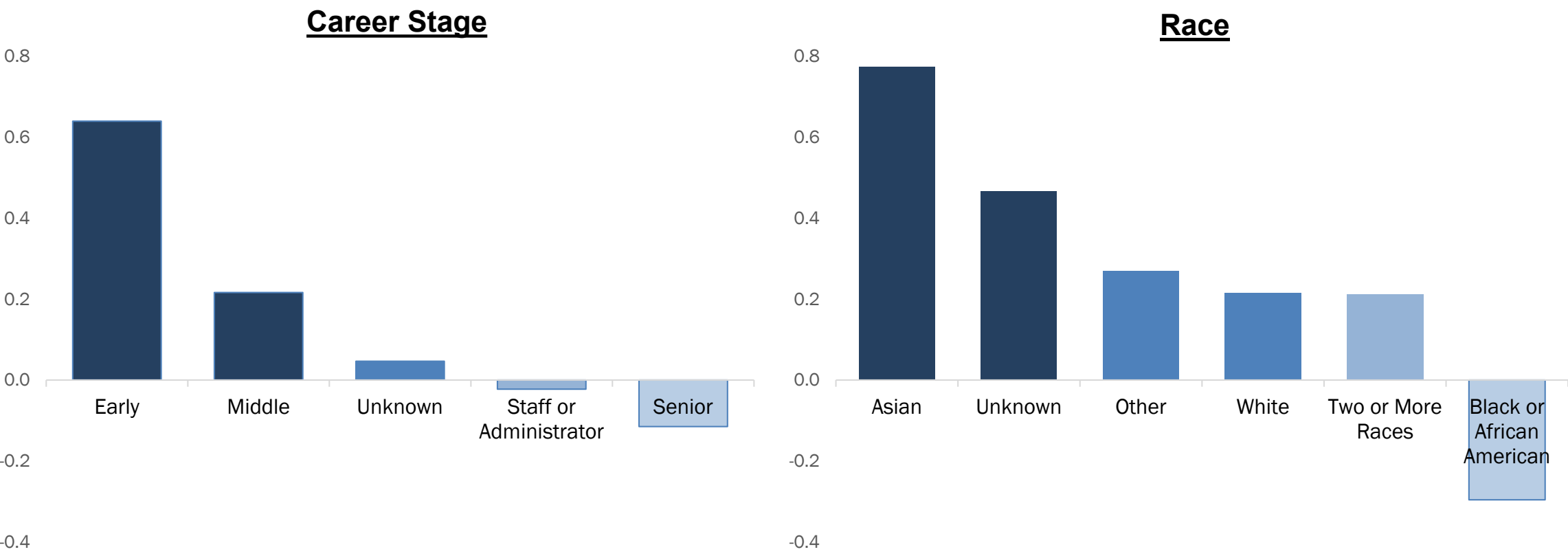
The table above contains the independent variables that hold the **most predictive power** when trying to predict a survey respondent’s level of agreement to the **statement in Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 83.3.

If you are interested in the analytical methods used, please refer to the [appendix section here](#).  
**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”

# Impact on Career Trajectory – Partial Dependence Plots

After accounting for the other covariates, **early-career investigators** had the greatest association with an anticipated negative career trajectory among all career stages. **Asian researches** had the **greatest marginal effect** on an anticipated negative career trajectory among all race groups.

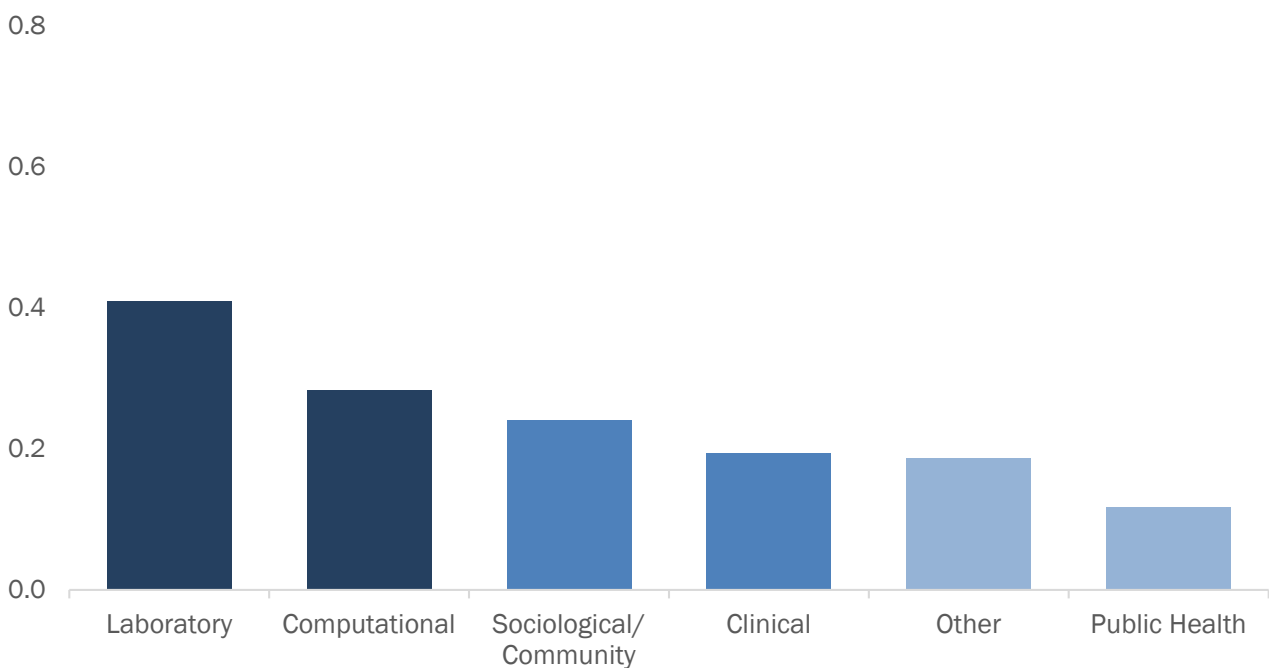


If you are interested in the analytical methods used, please refer to the [appendix section here](#).  
**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”

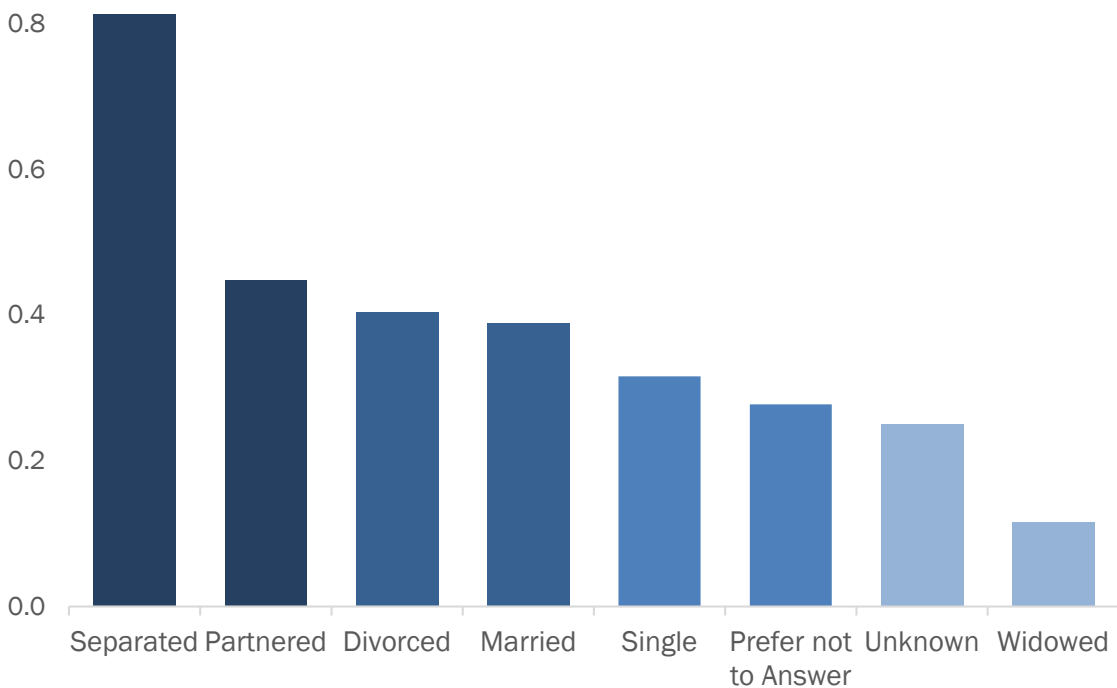
# Impact on Career Trajectory – Partial Dependence Plots

After accounting for the other covariates, primarily conducting **laboratory-based research** had the greatest association with the perception of a negative career trajectory among all research types. For marital status, being **separated** had the greatest marginal effect on a negative career trajectory.

Primary Type of Research



Marital Status



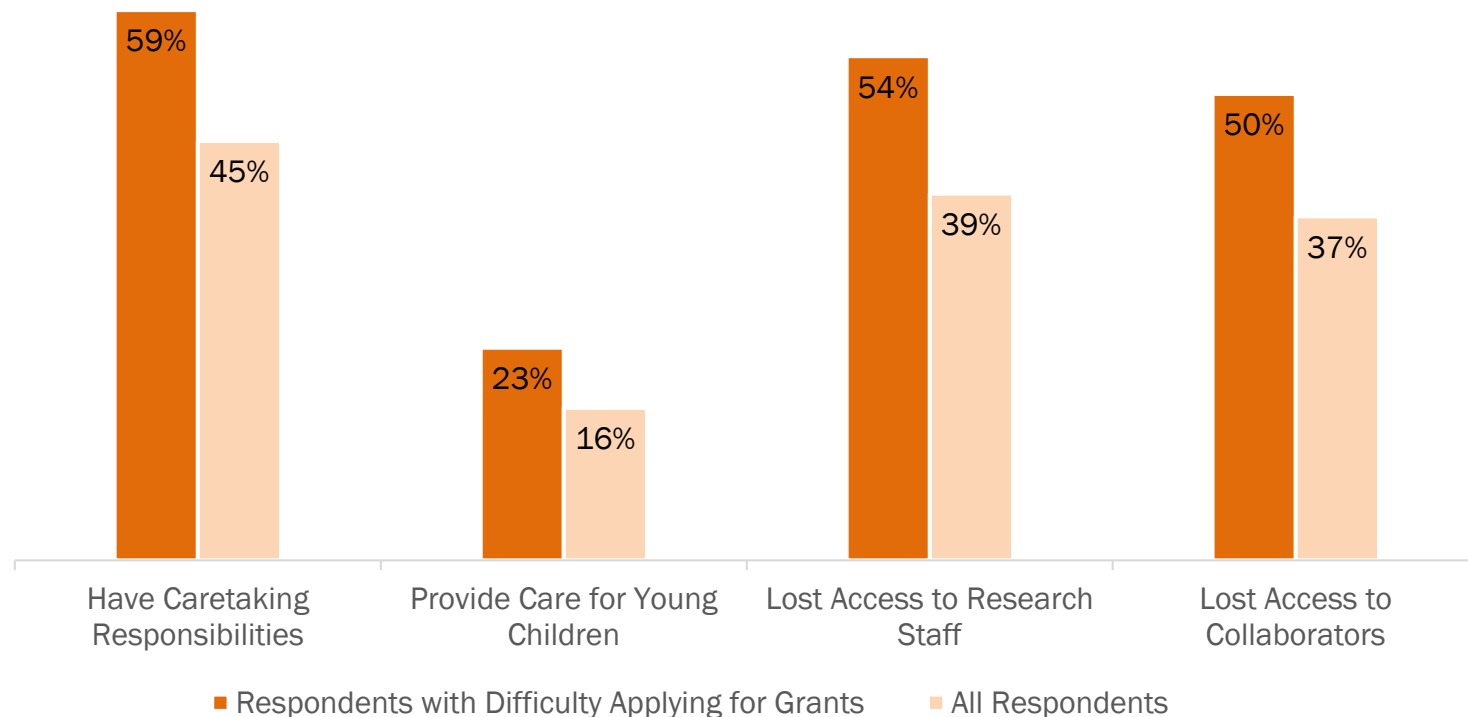
If you are interested in the analytical methods used, please refer to the [appendix section here](#).  
**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”



# Impact on Career Trajectory – Ability to Apply for Grants

Respondents citing difficulty applying for grants were significantly **more likely to have caretaking responsibilities** (including for young children specifically), and more likely to have **lost access to research staff and collaborators** due to the pandemic.

## Impact on Respondents with Difficulty Applying for Grants



### Key Findings

Among respondents who cited a negative impact on grant applications, there was a **significantly higher percentage with caretaking responsibilities (59% vs 45%)**, specifically for young children (**23% vs 16%**).

These respondents were also significantly **more likely to cite loss of access to research staff and collaborators** since March 2020.

The presence of these two factors potentially **affected the preliminary data gathering process** and negatively impacted respondents' ability to apply for grants.

**The chart (Q16, Q17, Q24)** above shows key factors affecting respondents who reported that the COVID-19 pandemic negatively impacted their ability to apply for grants.

# Impact on Career Trajectory – Modifying Variables by Group

**Impact on research-related activities** is the strongest predictor of a negative perception on career trajectory for Asian, Hispanic, and women researchers. **The ability to apply for grants** had significant predictive strength across all groups and was the most important factor for Black or African American researchers.

Strongest Independent Variables by Key Groups				
Independent Variable	African American AUC: 78.7	Asian AUC: 79.4	Hispanic AUC: 80.2	Women AUC: 81.6
Q28. Impact on Research-Related Activities		#1	#1	#1
Q47. Impact on Grant Application Ability	#1	#2	#2	#2
Q7/Q8. Primary Type of Research	#3	#3	#3	
Q6, 6a, 6b. Career Stage				#3
Q99. Marital Status	#2			

The table above contains the independent variables that hold the **most predictive power** when trying to predict a survey respondent’s response to **Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

If you are interested in the analytical methods used, please refer to the [appendix section here](#).  
**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”

# Section 3: Impact of the Pandemic on Research Productivity

Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
All Respondents	55%	78%	69%	42%	46%	44%
Race/Ethnicity White (69%)	53%	78%	75%	43%	48%	41%
Asian (22%)	65%*	78%	56%+	35%	41%+	51%
Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

\*More Negatively Impacted than Overall Average

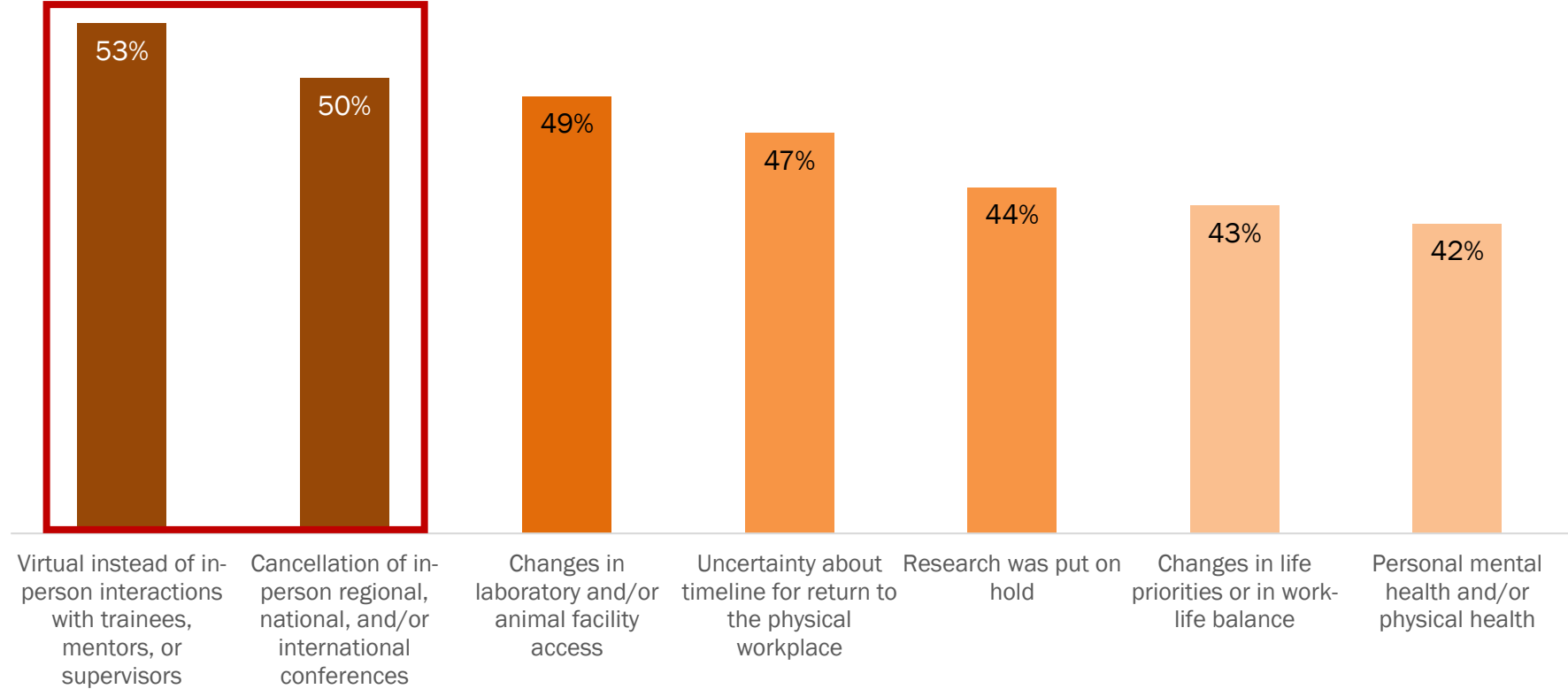
+Less Negatively Impacted than Overall Average

On par with Overall Average

# Impact on Research Productivity – Top Factors

**Virtual interactions** and **conference cancellations** were the top factors negatively affecting overall research productivity.

Top Factors that Negatively Impacted Productivity, Ranked



**Key Finding**

**Virtual interactions, conference cancellations, and changes in laboratory/facility access** were the top three factors negatively impacting productivity.

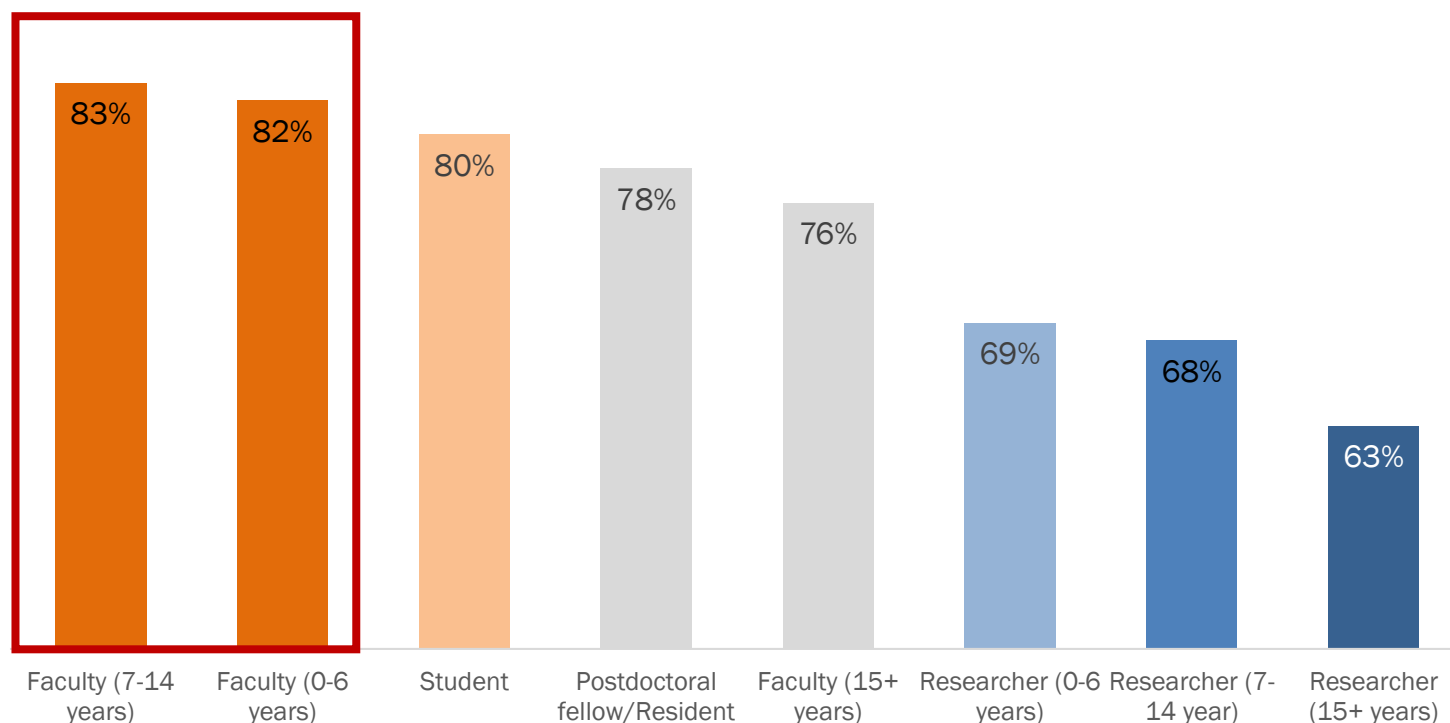
The **top factors varied little by career stage**, which indicates that these factors affected all career stages.

**The chart (Q26)** above ranks the factors that the highest percentage of respondents cited as negatively impacting productivity. Respondents chose from a total of 24 factors.

# Impact on Research Productivity by Career Stage

Over 80% of non-senior faculty and students stated that their productivity has been lower since the pandemic began.

% Negative Impact by Career Stage, Ranked



## Key Finding

Faculty with 0-14 years of experience were more likely than average to cite negative impacts on their research productivity. **Faculty at each career stage were more likely than Researchers** to cite negative impacts on their productivity.

Upon further analysis, **57% of faculty reported spending more time on administrative activities** since the pandemic began, compared to only **45% of researchers**. Thus, time spent on non-research obligations may have contributed to more negative impacts on productivity among faculty.

The chart (Q6-6b) above ranks career stages by percentage of respondents who cited lower-than-normal productivity since the pandemic began.

# Impact on Research Productivity by Key Groups

**Personal mental and/or physical health was the top factor** affecting productivity for early-career investigators, Black or African American researchers, and Hispanic or Latino researchers.

Top Factors Negatively Impacting Productivity by Key Groups

	#1 Most Negative Factor	#2 Most Negative Factor	#3 Most Negative Factor
Lab-based Researcher	Lab Access Changes	Virtual Interactions	Timeline Uncertainty
Early-career Investigator	Mental/Physical Health	Virtual Interactions	Changes in Life Priorities
African American	Mental/Physical Health	Changes in Life Priorities	Conference Cancellations
Asian	Virtual Interactions	Conference Cancellations	Changes in Life Priorities
Hispanic/Latino	Mental/Physical Health	Virtual Interactions	Changes in Life Priorities

Key Finding

Mental/physical health was the **top factor impacting productivity for early-career, Black or African American, and Hispanic researchers**, whereas it was the seventh factor overall.

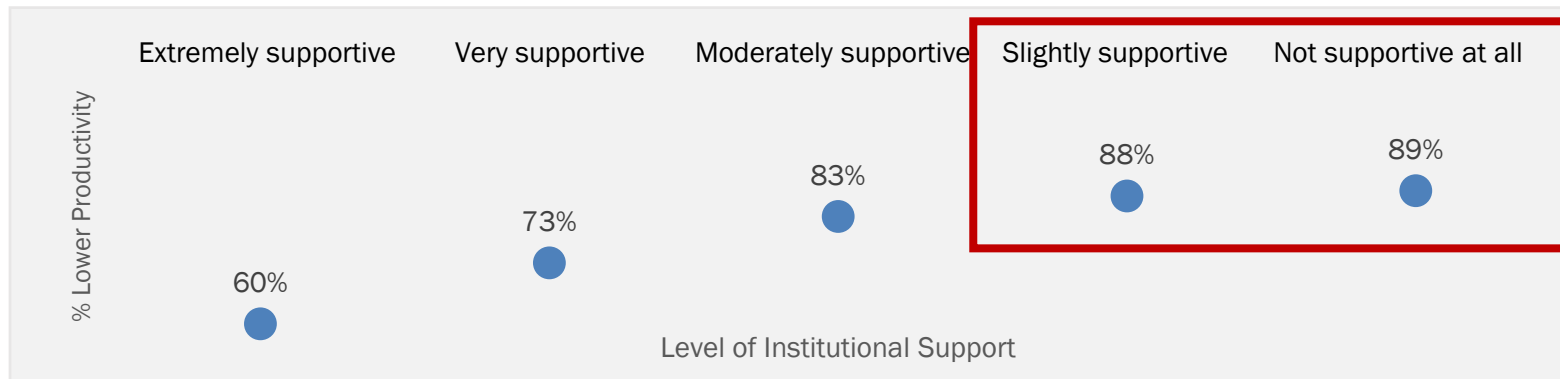
This indicates how the pandemic has affected the mental and/or physical health of certain groups more significantly than others.

The table (Q85-Q91) above ranks the top factors by key demographic groups in which the highest percentage cited as negatively impacting their research productivity.

# Impact on Research Productivity by Institutional Support

Higher levels of institutional support corresponded to a smaller percentage of respondents reporting lower research productivity.

**% Lower than Normal Research Productivity by Level of Institutional Support**



**The chart (Q65)** above maps out the percent of respondents that cited lower-than-normal research productivity since the pandemic began, by the level of institutional support they have received.

## **Key Finding**

The proportion of respondents citing negative impacts on research productivity increases as the level of institutional support decreases – **89% at institutions with low support levels** compared to **60% at highly supportive institutions**.

This indicates that institutional support played an important role in mitigating the negative impacts on research productivity during the pandemic.

# Impact on Research Productivity – Modifying Variables

**Negative impact on productivity due to changes in lab access and the ability to apply for grants** were the two most important predictors of research productivity during COVID-19, per the generalized boosted model. The only non-research-related driver affecting productivity was **caretaking and its effect on the ability to complete work responsibilities**.

Top 10 Variables	Importance
Q26. Negative Impact on Productivity: Changes in Laboratory/Animal Facility Access	15.5
Q47. Impact on Grant Application Ability	10.3
Q26. Negative Impact on Productivity: Research Put on Hold	10.0
Q24. I Have Not Lost Access to Research Resources	9.0
Q7/Q8. Primary Type of Research	8.2
Q24. Lost Access to Facilities/Lab Spaces	5.9
Q26. Negative Impact on Productivity: Uncertainty About Timeline for Return to Workplace	3.7
Q26. Negative Impact on Productivity: Virtual Instead of In-person Interactions with Trainees, Mentors, or Supervisors	3.7
Q20. Caretaking Impact on Difficulty Completing Work Responsibilities	3.2
Q26. Negative Impact on Productivity: Teleworking	2.6

The table above contains the independent variables that hold the **most predictive power** when trying to predict a survey respondent's level of agreement to the **statement in Q25 – “How would you rate your research productivity during the pandemic?”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 83.6.

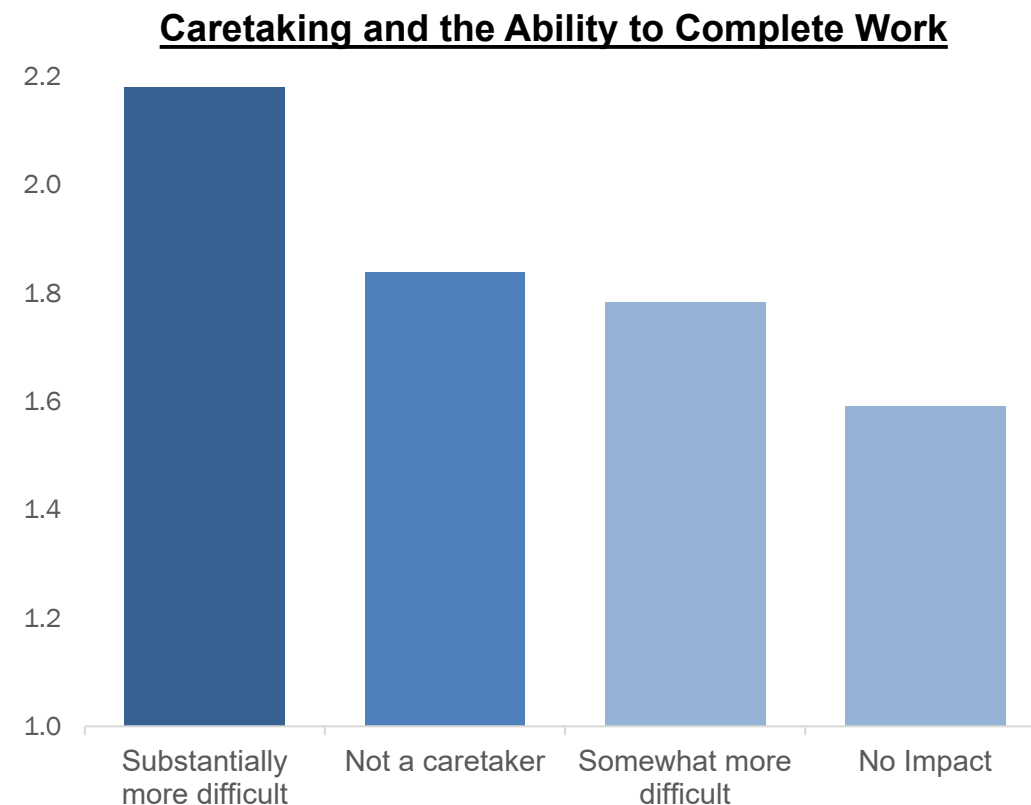
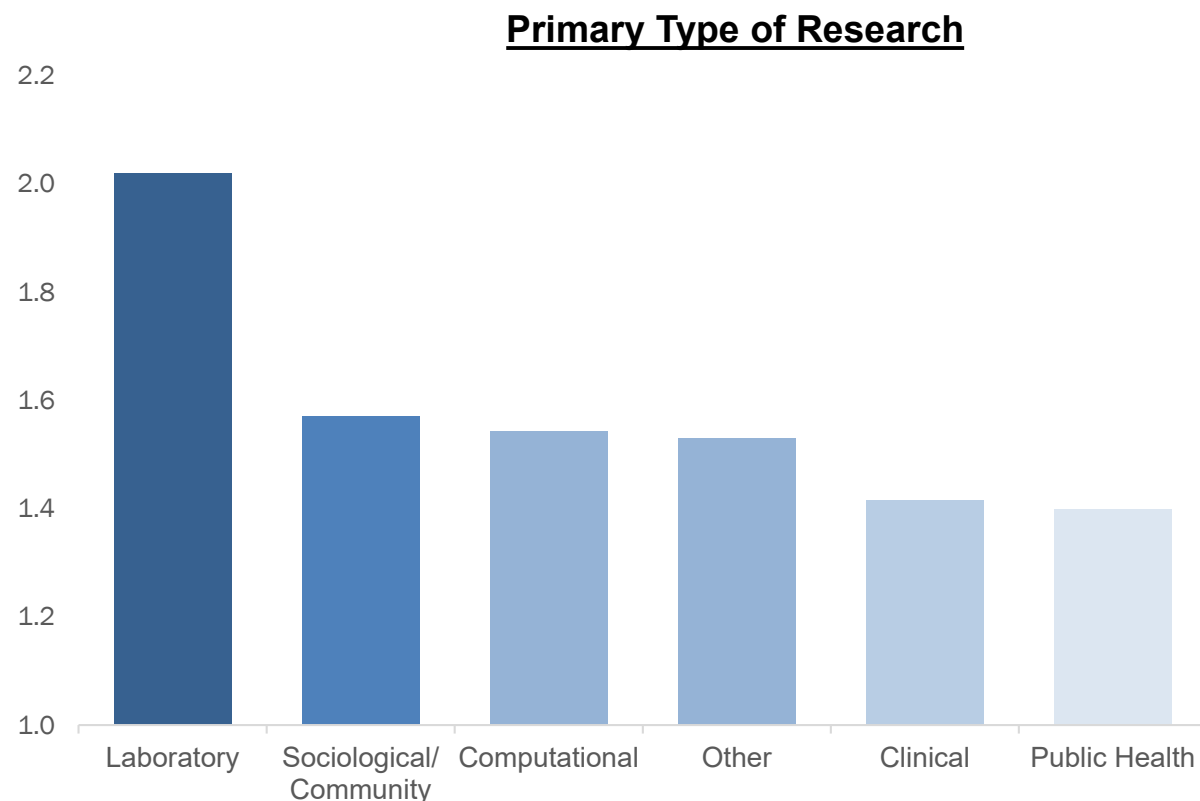
If you are interested in the analytical methods used, please refer to the [appendix section here](#).

**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”



# Impact on Research Productivity – Partial Dependence Plots

After accounting for the other covariates, conducting **laboratory-based research** had the greatest association with decreased productivity among all research types. Caretakers reporting that **caretaking made it substantially more difficult to complete work** also had a large marginal effect on productivity.



If you are interested in the analytical methods used, please refer to the [appendix section here](#).

**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”

# Impact on Research Productivity – Modifying Variables by Group

The **primary type of research a respondent conducted** was among the most important predictors of research productivity for Black or African American, Asian, Hispanic, and women respondents. **Impact on the ability to apply for grants** and **research being put on hold** were also important predictors of decreased research productivity as a result of COVID-19.

Strongest Independent Variables by Key Groups				
Independent Variable	African American AUC: 80.7	Asian AUC: 83.8	Hispanic AUC: 83.8	Women AUC: 82.9
Q47. Impact on Grant Application Ability	#1			#2
Q7/Q8. Primary Type of Research	#2	#2	#1	#3
Q26. Research Put on Hold	#3		#2	
Q24. I Have Not Lost Access to Research Resources		#1		
Q26. Changes in Laboratory/Animal Facility Access		#3	#3	#1

The table above contains the independent variables that hold the **most predictive power** when trying to predict a survey respondent’s response to **Q25 – “How would you rate your research productivity during the pandemic?”**

If you are interested in the analytical methods used, please refer to the [appendix section here](#).  
**Note:** Missing values were either treated as a separate class (“Unknown”) or imputed based on the missing data mechanism, with the former used for “Missing not at Random” and latter “Missing at Random.”

## Section 4: Impact of the Pandemic on Mental Health

Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
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Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

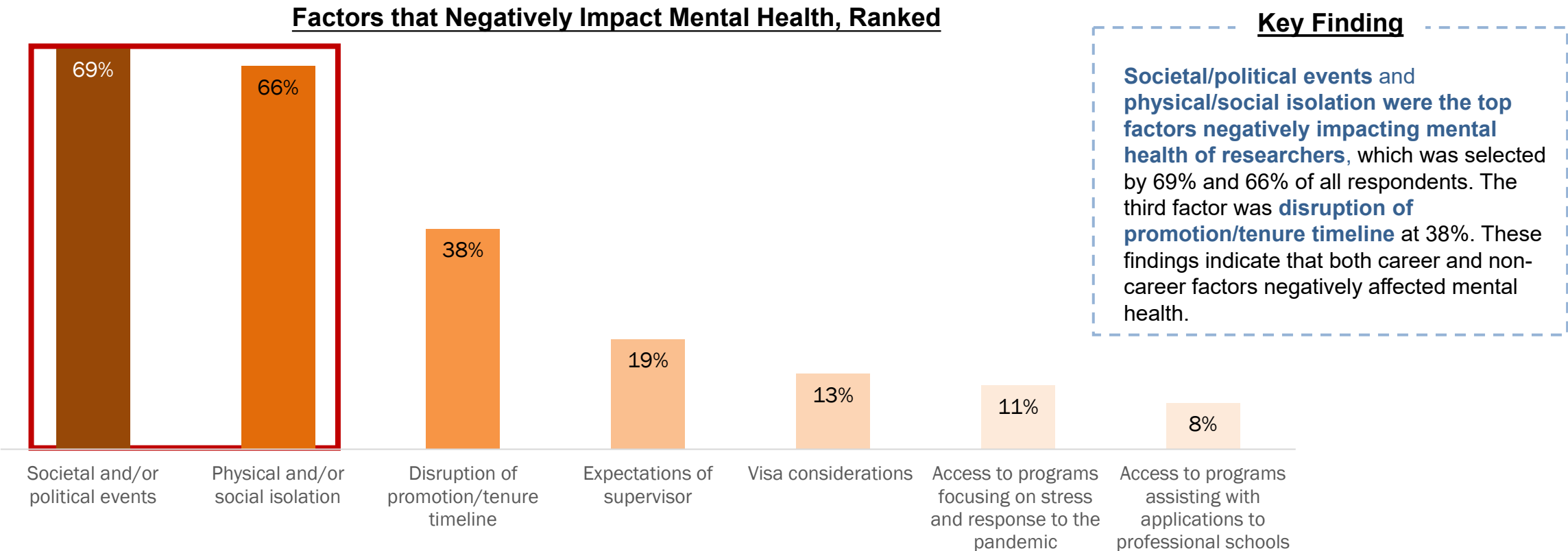
\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

On par with Overall Average

# Impact on Mental Health – Top Factors

**Societal and/or political events** and **physical and/or social isolation** were the top two factors negatively impacting the mental health of respondents.

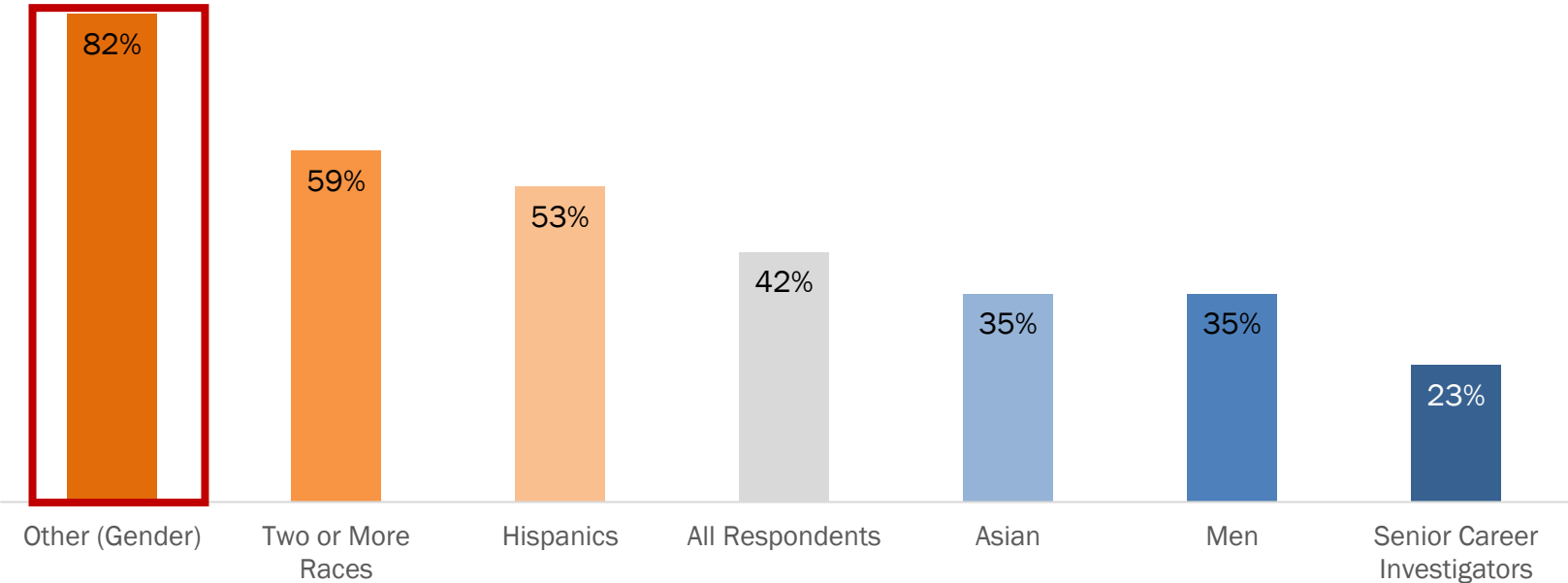


The chart (Q85-91) above ranks the factors that the highest percentage of respondents cited as negatively affecting their mental health.

# Impact on Mental Health by Key Groups

Respondents with an “other” gender identity were the most likely group to report that their personal mental and/or physical health has negatively impacted their productivity.

% Mental/Physical Health Negatively Impacting Productivity by Key Groups, Ranked



**Key Finding**

82% of respondents of an “other” gender identity cited mental/physical health as negatively impacting productivity, almost twice the average rate of 42%. Respondents of two or more races and Hispanic respondents were also more than 10% above the average rate.

Asian respondents, men, and senior career investigators were the least likely to say the same.

The chart (Q6-6b, Q95-97) above lists the demographic groups that indicated mental/physical health had a negative impact on their productivity at a rate substantially higher or lower than the average.

# Impact on Mental Health by Key Groups

**Promotion disruptions** and **supervisor expectations negatively impacted the mental health** of respondents with **caretaking responsibilities** and respondents with an **“other” gender identity** at a higher rate than other demographic groups.

Top Professional Factors Negatively Impacting Mental Health by Key Groups

	Promotion Disruptions	Supervisor Expectations	Visa Considerations
Hispanics	40%	23%	15%
Asians	39%	18%	27%
Black or African Americans	29%	20%	8%
Caretakers	41%	19%	11%
Other (Gender)	48%	35%	10%

Key Finding

Among top factors affecting mental health, societal/political events and physical/social isolation were consistently ranked top two for each demographic. What about the rest?

**Caretakers and respondents with an “other” gender identities cited promotion/tenure disruptions and supervisor expectations as affecting mental health at a higher-than-average rate.**

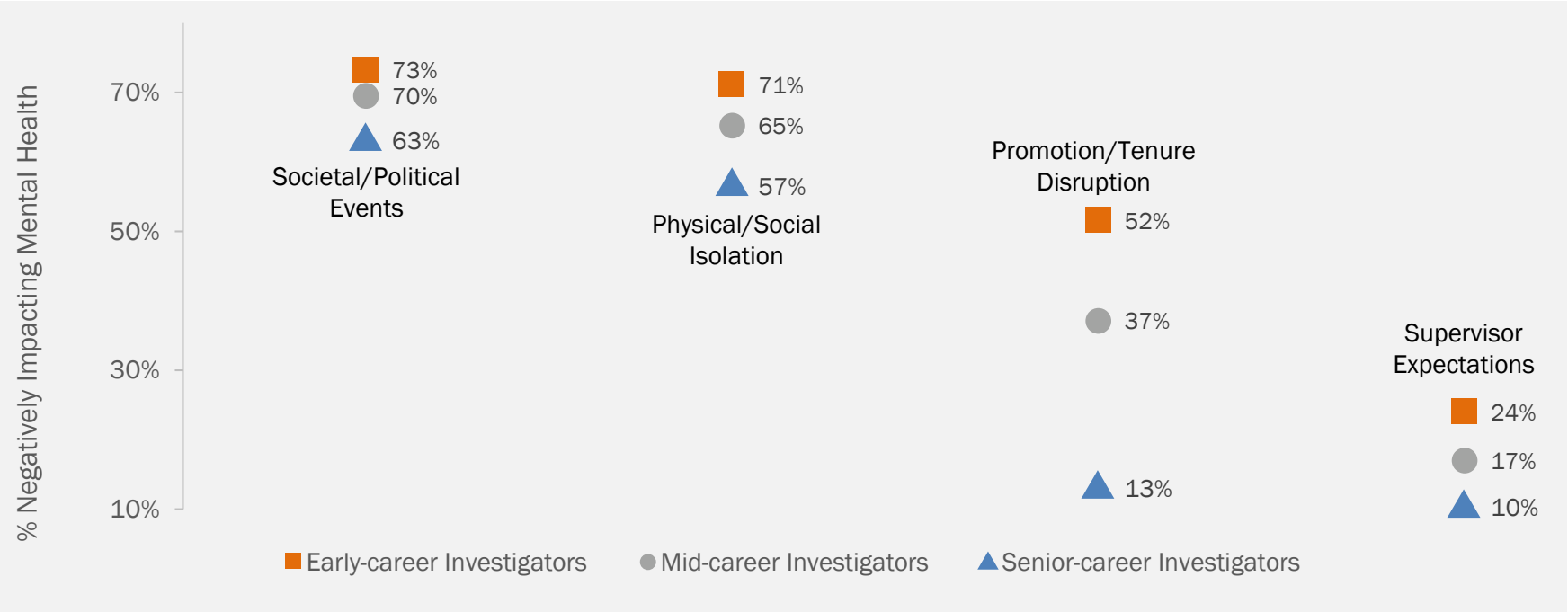
Asian respondents cited visa considerations as affecting mental health at more than double the overall percentage **(27% vs 13%)**.

The table (Q85, Q88-89, Q95-97, Q16) above lists the percent of respondents by key demographics who cited specific professional factors as negatively impacting their mental health.

# Impact on Mental Health by Career Stage

**Early-career investigators were consistently more negatively** affected across key factors impacting mental health than investigators with more experience.

Impact of Key Factors by Career Stages



Key Finding

Among top factors impacting mental health, **early-career investigators were consistently more negatively affected** than mid- and senior-career investigators.

This finding suggests that both research-related and non-research-related factors impacted early-career investigators more adversely than investigators at other career stages.

The chart (Q85, Q88, Q90-91, Q6-6b) above lists the percent of respondents by career stage who cited that a specific factor (top four) negatively impacted their mental health. Early-career investigators were consistently more negatively impacted than other career stages.

## Section 5: External Stressors

Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
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Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

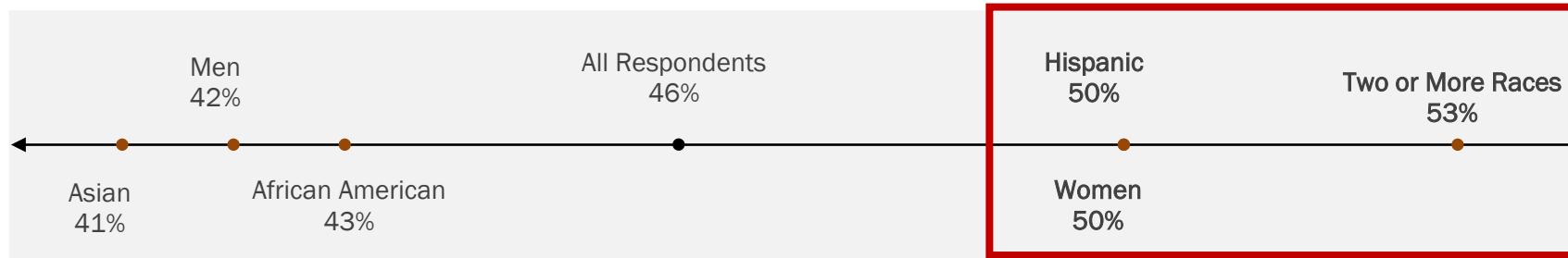
On par with Overall Average



# Impact of Caretaking by Race and Gender

Among respondents with caretaking responsibilities, **Hispanics, women, and those of two or more races** were the most likely to agree that caretaking has made it **substantially more difficult to complete work responsibilities**.

% Substantially More Difficult by Race and Gender



**The chart (Q95-97)** above presents key caretaker groups that deviated substantially from the average rate agreeing that “caretaking has made it substantially more difficult to complete work responsibilities”.

## Key Findings

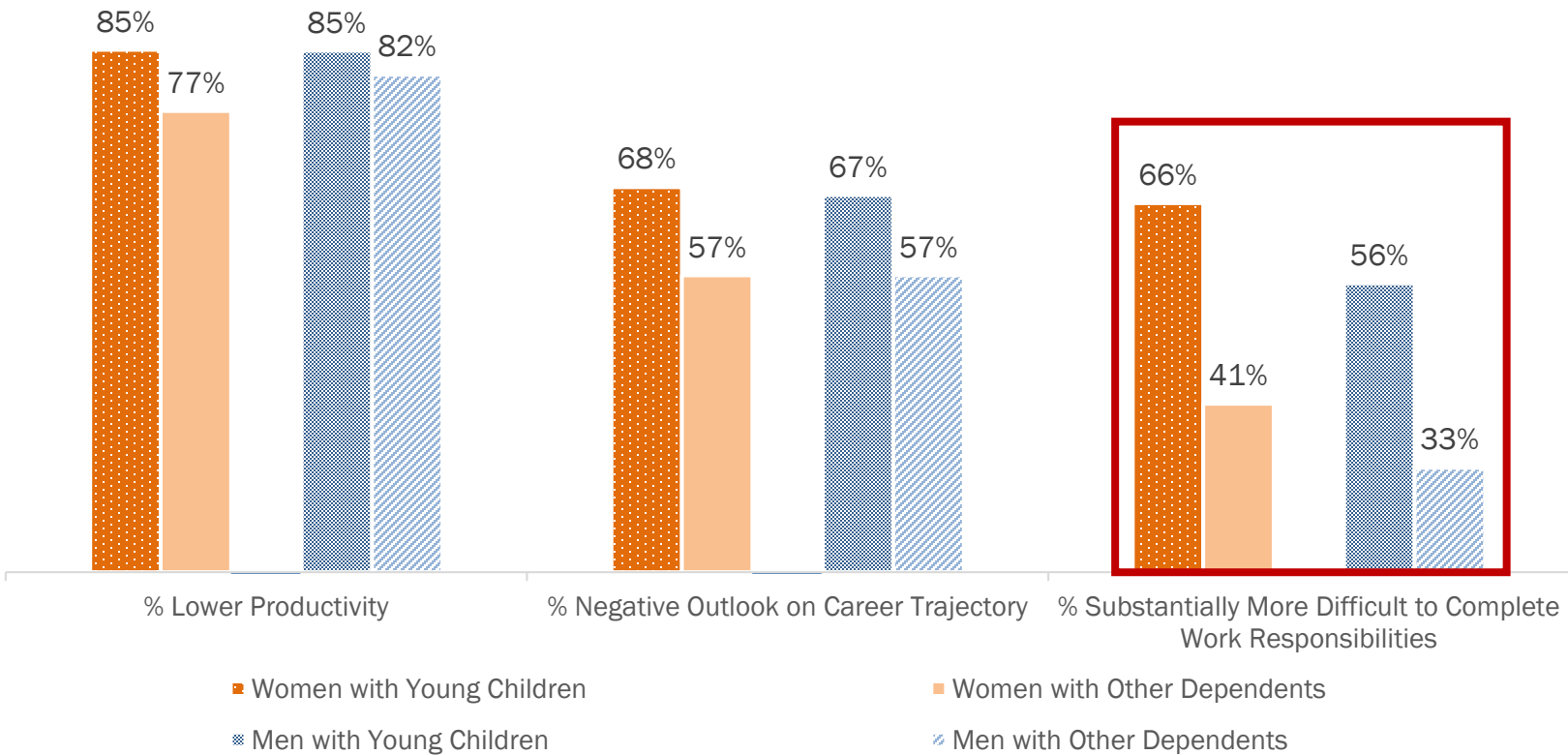
Among respondents with caretaking responsibilities, those who identified as **Hispanic, women, or with two or more races** were the most likely to indicate that caretaking made it more difficult to complete their work, **at above 50%**.

On the other hand, caretakers who identified as **Asian, Men, or Black or African American** were the least likely to indicate the same.

# Impact of Caretaking by Gender and Type of Dependent

Among respondents with caretaking responsibilities, men and women had similar response rates regarding lower productivity and negative outlook on career trajectory. However, **women found it significantly more difficult to complete work responsibilities than men.**

Impact of Caretaking by Gender and Type of Dependent



The chart (Q25, Q50, Q20, Q17) above shows how the men and women with caretaking responsibilities differ in their response to key factors.

## Key Findings

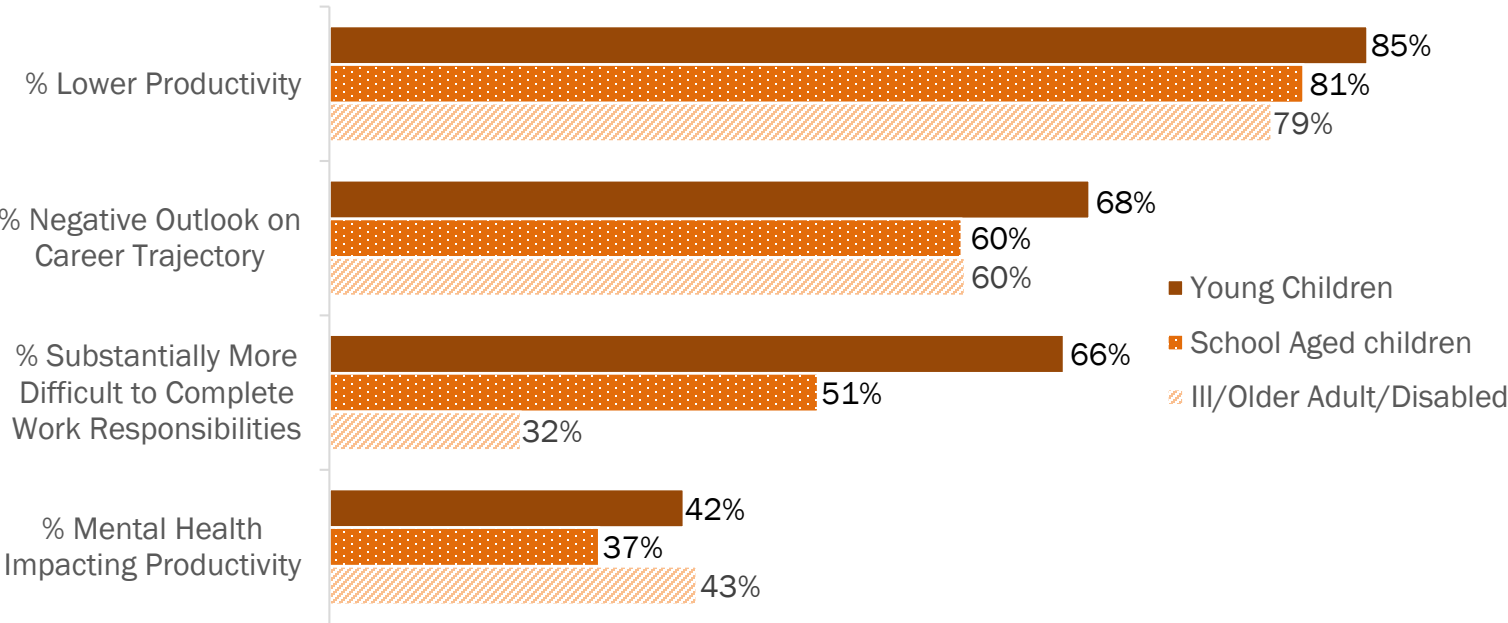
Women were more likely than men to say that their caretaking duties made it **substantially more difficult** to complete work responsibilities (66% vs 56% for caretakers with children under 5).

There were no significant differences between men and women in terms of negative outlook on career trajectory or lower research productivity.

# Impact of Caretaking on Women by Type of Dependent

Among women researchers, **caretakers of young children** were more **negatively impacted across several key outcome variables related to work and mental health** compared to caretakers of school-aged children (5-18) or ill/older adult/disabled dependents.

Impact by Type of Dependent



Key Findings

**Women caretakers of young children (ages 5 and under) were consistently more negatively impacted** in terms of:

- 1) Lower research productivity
- 2) A more negative outlook toward career trajectory
- 3) Substantial difficulty completing their work responsibilities, and
- 4) Mental health negatively impacting productivity

Women caretakers of adult dependents were the least likely to cite substantial difficulty completing work responsibilities.

The chart (Q17) above shows how the type of dependent the respondent provides care for affects the respondent across four aspects.

# Impact of Caretaking on Women by Career Stage

Among women respondents with caretaking responsibilities, **early-career investigators were more negatively impacted** across various factors than mid-career investigators.

Impact of Pandemic on Caretakers by Career Stage

Career Stage	% Lower Productivity	% Career Trajectory Impacted	% Mental Health Negatively Impacted Productivity
Early-career Investigator	84%	69%	51%
Mid-career Investigator	82%	64%	42%

The table (Q6-6b) above shows how career stage affected caretakers in terms of productivity, career trajectory perception, and mental health.

Caretaking Status by Career Stage

- 75%

Of women mid-career investigators identified as a caretaker
- 38%

Of women early-career investigators identified as a caretaker

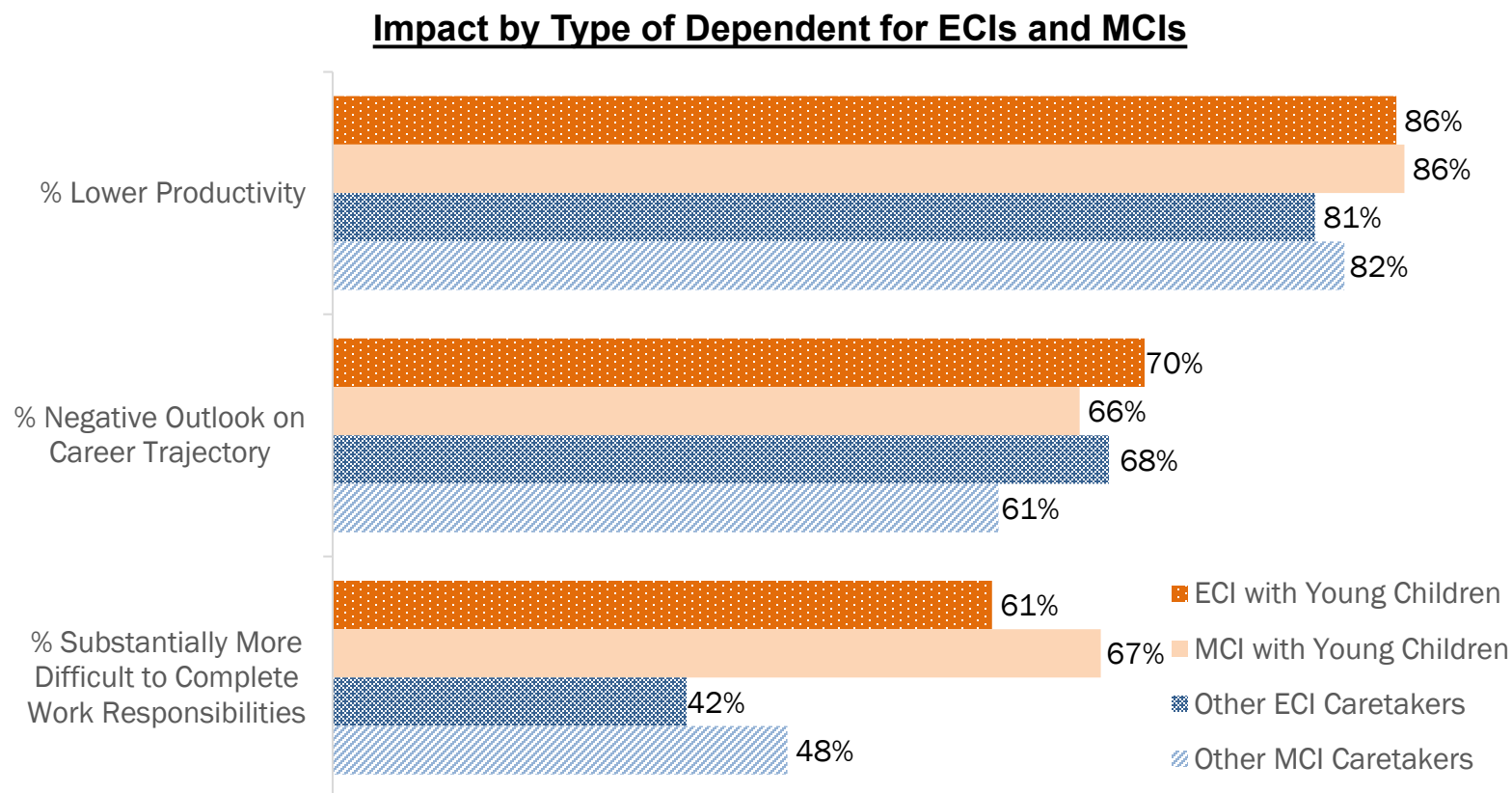
Key Findings

Among women respondents, mid-career investigators were twice as likely as early-career investigators to have caretaking responsibilities.

However, among women with caretaking responsibilities, early-career investigators consistently reported **lower productivity, being substantially affected by mental/physical health and a more negative outlook towards their career trajectory** compared to mid-career investigators.

# Impact of Caretaking on Women by Type of Dependent

Among women, early- and mid-career investigators (ECIs and MCIs) providing care for young children were the **most negatively impacted of caretakers across several key measures**.



The chart (Q6-6b, Q17, Q25, Q50, Q20) above shows how the type of dependent the respondent provides care for affects the respondent at different career stages.

## Key Findings

Early- and mid-career women providing care for young children were more negatively impacted compared to other caretakers in terms of:

- 1) Research productivity, and
- 2) Difficulty completing work responsibilities

Regardless of the age of the dependent, **early-career investigators had a more negative outlook on their career trajectory than mid-career investigators.**

These findings indicate that caring for younger children affected research productivity for researchers regardless of career stage.

# Impact of Caretaking on Women by Caretaking Help

Among women respondents, caretakers **paying for part-time caretaking help** were more likely to report lower productivity, a negative outlook toward their career trajectory, and **difficulty completing work responsibilities**.

**Impact of Paying for Caretaking**

Method of Paying for Caretaking	% Lower Productivity	% Career Trajectory Impacted	% Substantially more Difficult
Full-time	84%	66%	61%
Part-time	87%	70%	71%
Not paying for help	77%	56%	38%

The table (Q21-22) above shows how the method of paying for caretaking affected women caretakers in terms of productivity and career trajectory perception.

**Key Findings**

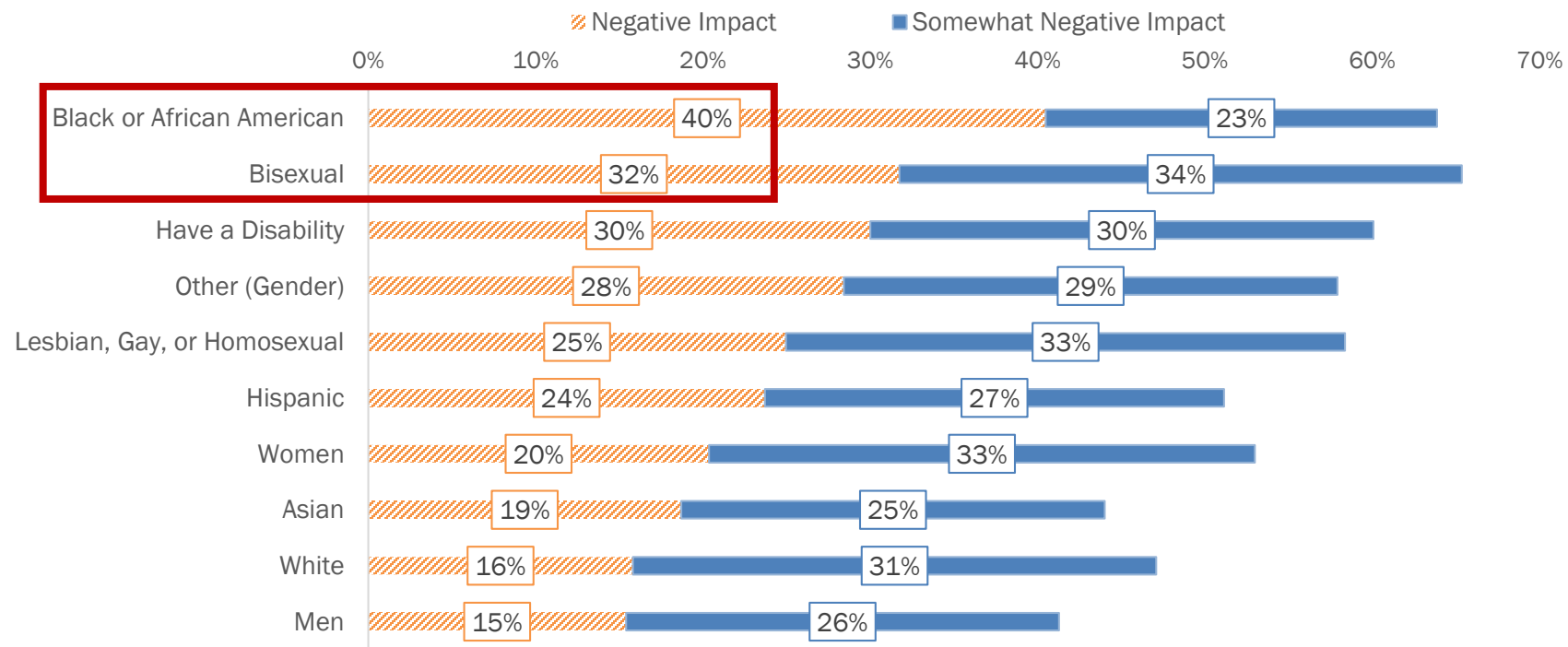
Among respondents who identified as women with caretaking responsibilities, **those paying for caretaking help were more negatively impacted** in terms of **lower productivity, a more negative outlook on career trajectory, and substantial difficulty completing work** compared those not paying for caretaking help.

Interestingly, **respondents paying for part-time help were even more negatively impacted than those paying for full-time help.**

# Impact of Civil Unrest by Key Groups

Among key demographic groups, **Black or African American researchers** and **researchers who identified as bisexual** were the most likely to cite civil unrest tied to racism as negatively impacting their research productivity, at 40% and 32%, respectively.

## How has civil unrest tied to racism impacted your research productivity? It has had a...



The chart (Q92, Q6-6b) above lists the percent of respondents by key groups that cited civil unrest tied to racism as negatively impacting their productivity.

### Key Findings

The reported **impact of civil unrest tied to racism on productivity** was examined by the following groups:

- 1) Race
- 2) Ethnicity
- 3) Gender identity
- 4) Sexual orientation
- 5) Disability status

Among these groups, **Black or African American respondents** were the most impacted at **40%**, followed by respondents who consider themselves to be **bisexual at 32%**.

On the other hand, respondents identifying as men and as White were the least impacted among all groups at 15% and 16%, respectively.

# Section 6: Organizational Support During the Pandemic

Sections:	Section 2	Section 3	Section 4	Section 4	Section 5	Section 6
Response to Key Questions:	Pandemic will have a Negative Impact on Career Trajectory	Lower Job Productivity	Societal/Political Events Negatively Impacted Mental Health	Personal Mental/Physical Health Negatively Impacted Productivity	Caretaking has Made it Substantially More Difficult to be Productive	Organization was Supportive in Helping to Remain Productive*
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Asian (22%)	65%*	78%	56%+	35%	41%+	51%
Hispanic/Latino (9%)	56%	79%	68%	53%*	50%	46%
Black/AA (4%)	39%+	75%	65%	48%	43%	58%+
Two or More Races (3%)	59%	82%	80%*	59%*	53%*	38%
AIAN (0.4%)	44%+	77%	57%+	52%*	48%	44%
NHPI (0.1%)	50%	69%	70%	52%*	47%	57%+
Gender Identity Men (46%)	55%	79%	63%	35%	42%+	46%
Women (53%)	55%	77%	76%	48%	50%	42%
Other (0.7%)	59%	79%	85%*	81%*	42%+	33%*
Career Stage Early (53%)	63%*	80%	73%	52%*	53%*	42%
Mid-career (19%)	60%	81%	70%	36%	53%*	39%

\*More Negatively Impacted than Overall Average

\*Less Negatively Impacted than Overall Average

On par with Overall Average



# Institutional Support – Qualitative Feedback

Respondents who reported that their organizations have been slightly supportive or not supportive in helping to remain productive during the COVID-19 pandemic were asked the following open-ended question: **What steps should your organization take that will make you feel more supported?**

An analysis of the **4,329 responses** indicates that **funding is the key issue**, mentioned in nearly half of the responses.\*

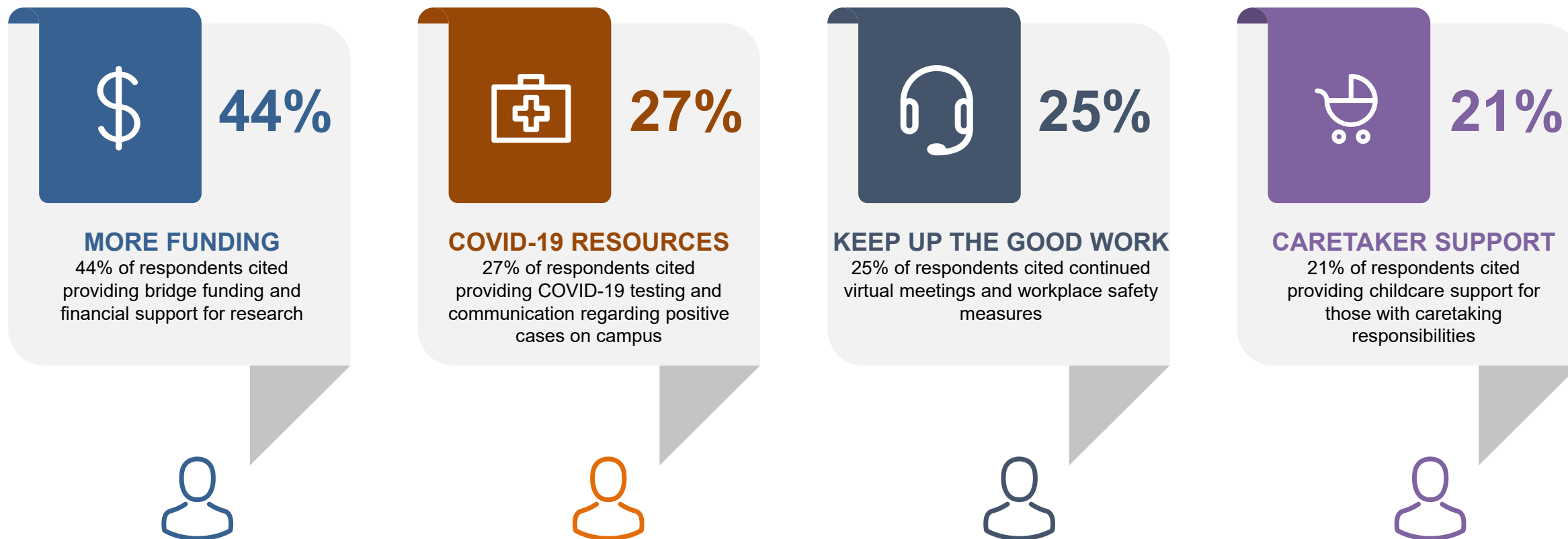


\*The natural language processing software, WordStat, was used to identify the most common themes in responses to Q66. The percent values associated with each theme represent the prevalence of a theme across all write-in comments (comments may be associated with one or multiple themes)

# Institutional Handling of COVID-19 – Qualitative Feedback

Respondents were asked the following open-ended question: **In your opinion, what can your institution do to improve how they are handling things?**

An analysis of the **17,180 responses** showed that **funding** was once again the **most important issue**.\*

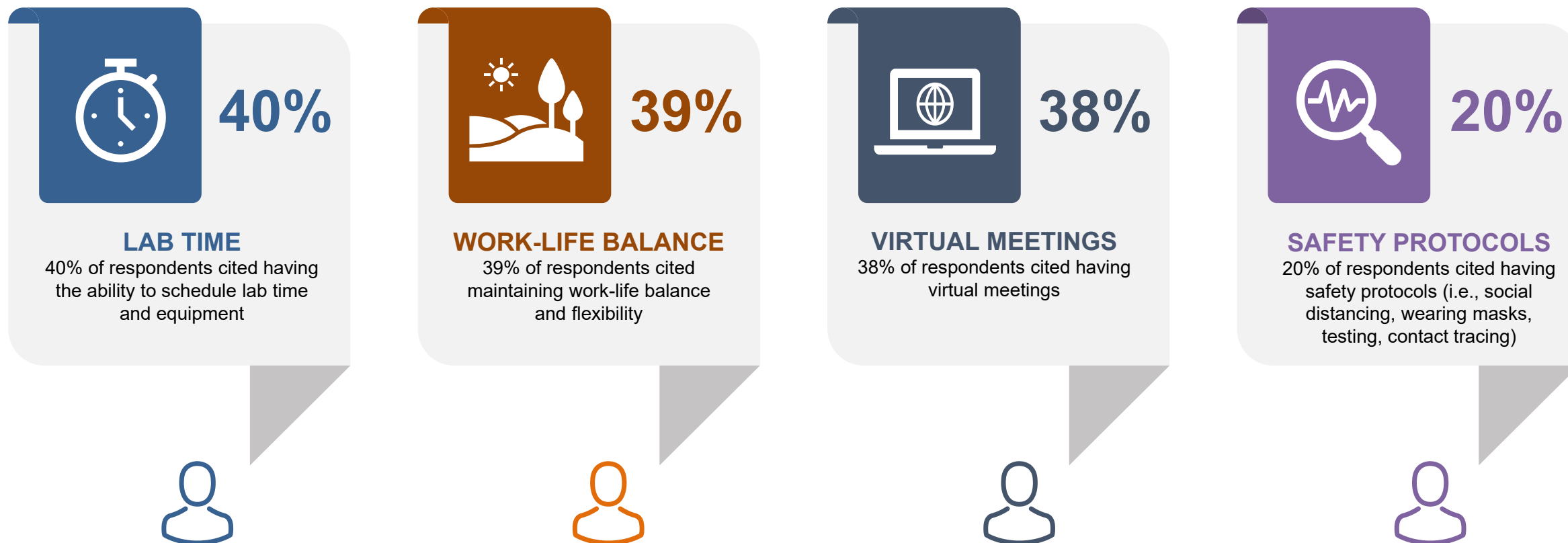


\*The natural language processing software, WordStat, was used to identify the most common themes in responses to Q60. The percent values associated with each theme represent the prevalence of a theme across all write-in comments (comments may be associated with one or multiple themes)

# Strategies for Overcoming Challenges – Qualitative Feedback

Respondents were asked the following open-ended question: **Please share any successful strategies on how you and/or your lab or department are overcoming work challenges and approaching new situations during the COVID-19 pandemic.** 11,092 responses were collected.

The main themes identified below provide **further evidence** of the role of **lab-based research** and **physical health** in shaping opinion.\*



\*The natural language processing software, WordStat, was used to identify the most common themes in responses to Q93. The percent values associated with each theme represent the prevalence of a theme across all write-in comments (comments may be associated with one or multiple themes)

# Extramural Institutions Survey

# Institutional Characteristics

In October 2020, 224 research leaders from the top 1,000 NIH-funded domestic institutions responded to the *NIH COVID-19 Impact Extramural Institution Survey*. Over half (53%) led research at doctorate-granting universities with professional schools.

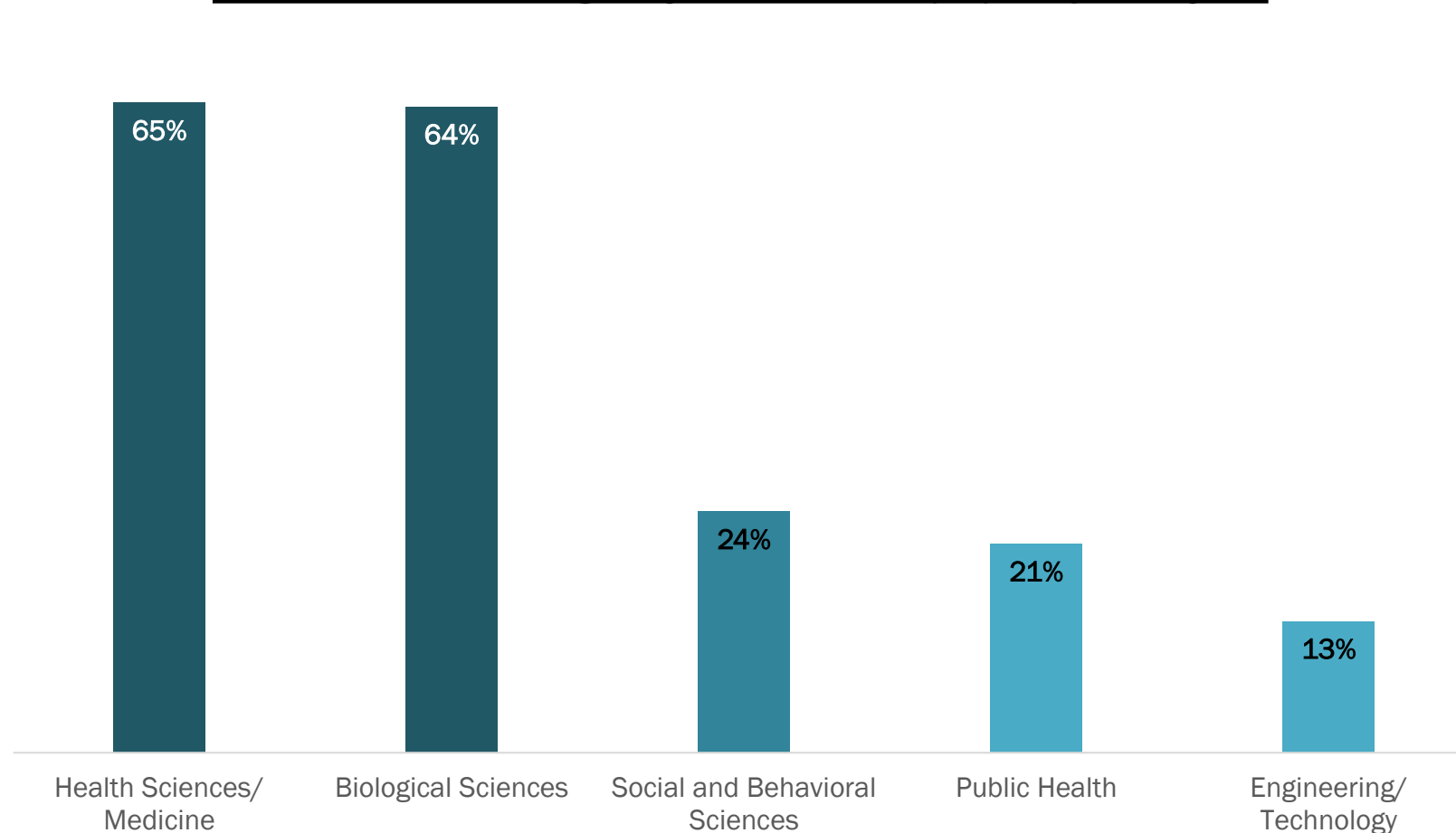
**Type of Institution (Q1)**



- **53%** (N=117) **Doctorate granting university with professional school**
- **19%** (N= 42) **Independent research organization**
- **17%** (N=38) **Doctorate granting university without a professional school**
- **7%** (N=15) **Special focus institution & Other**
- **5%** (N=10) **Masters/Baccalaureate College/University\***

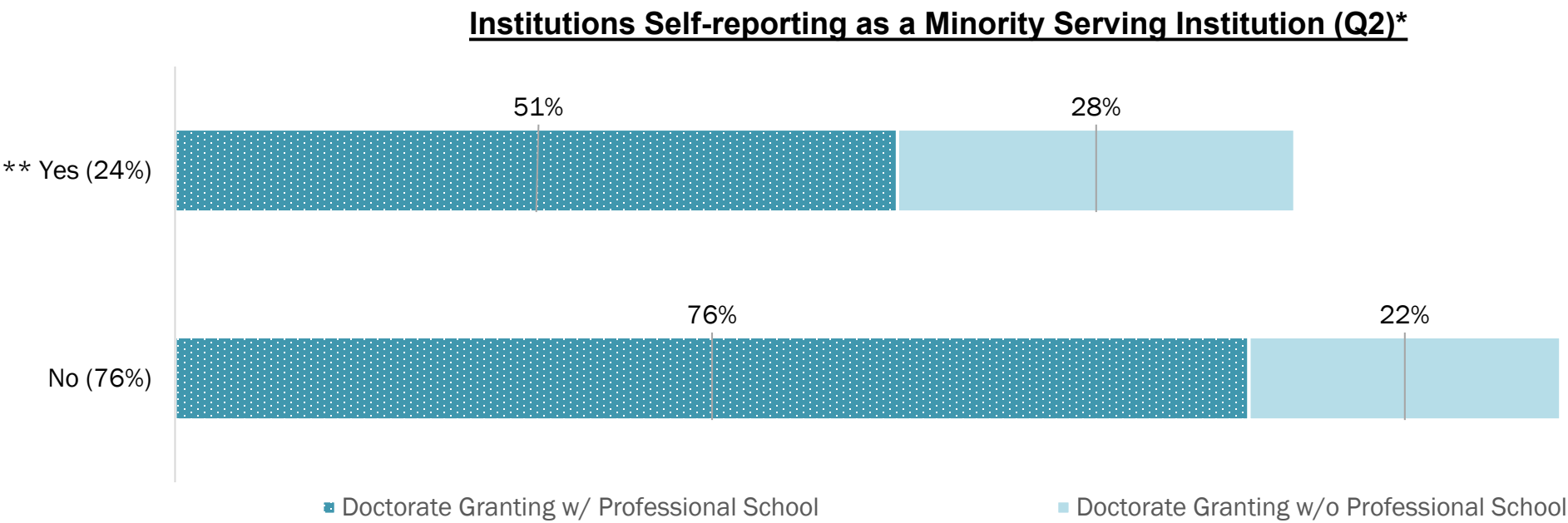
\* Included to provide a complete overview of responses, though the small n-size precludes further analysis

**Institutions NIH-funding Subject Breakdown (Q6) – Top 5 Subjects**



# Institutional Characteristics

24% of respondents indicated that **they** led research at Minority Serving Institutions (MSIs).



\* Due to a small n-size, institutions that identified as a Masters or Baccalaureate College/University are not shown.

\*\* Of the self-reported minority-serving institutions, 60% reported as a Hispanic Serving Institution (HIS), 29% reported as Asian American and Native American Pacific Islander-Serving Institution (AANAPISI), 11% reported as Other, 9% reported as a Historically Black College or University (HBCU), 6% reported as a Primarily Black Institution (PBI), and Tribal College or University (TCU)/Native American Non-Tribal Institution (NANTI)/Alaskan Native or Native Hawaiian-Serving Institution (ANNHI) all reported at 2% (Q3).

# High-Level Findings

The heat map below presents responses by institution type on the impact of COVID-19 on institutional **finances and research functions**, and efforts to **mitigate the pandemic's impact**.

## Proportion Reporting ...

Sections:	Section 8	Section 8	Section 9	Section 9	Section 10	Section 10	Section 10
Key Questions	Research Functions will be Jeopardized	Moderate/Major Impacts in Research Productivity	Very/Extremely Concerned with Institution's Financial Status	Substantial Impact from Loss in Endowment	Testing Available to Anyone	Implementing COVID-19 Monitoring Measures	Providing/Expanding Facilities for Childcare
All Respondents	41%	83%	66%	15%	44%	83%	21%
Doctorate-granting University with a Professional School (53%)	49%*	85%	77%*	19%*	51%+	88%+	26%+
Doctorate-granting University without a Professional School (17%)	40%	82%	74%*	13%	58%+	90%+	-
Independent Research Institution (19%)	29%+	83%	33%+	-	31%*	81%	15%*
Special Focus/Other Institution (7%)	-	87%*	-	-	-	40%*	50%+
Minority-Serving Institution (24%)	51%*	74%+	77%*	17%	43%	87%	11%*
Non-Minority Serving Institution (76%)	44%	85%	76%*	15%	55%	88%+	23%

**Note:** For certain dependent variables, higher percentages correspond to a more negative impact; whereas for other dependent variables, higher percentages correspond to a less negative impact.

All percentages are out of valid totals, with missing values removed.

\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

On par with Overall Average

## Section 8: Research Activities

Sections:	Section 8	Section 8	Section 9	Section 9	Section 10	Section 10	Section 10
Key Questions	Research Functions will be Jeopardized	Moderate/Major Impacts in Research Productivity	Very/Extremely Concerned with Institution's Financial Status	Substantial Impact from Loss in Endowment	Testing Available to Anyone	Implementing COVID-19 Monitoring Measures	Providing/Expanding Facilities for Childcare
All Respondents	41%	83%	66%	15%	44%	83%	21%
Doctorate-granting University with a Professional School (53%)	49%*	85%	77%*	19%*	51%+	88%+	26%+
Doctorate-granting University without a Professional School (17%)	40%	82%	74%*	13%	58%+	90%+	-
Independent Research Institution (19%)	29%+	83%	33%+	-	31%*	81%	15%*
Special Focus/Other Institution (7%)	-	87%*	-	-	-	40%*	50%+
Minority-Serving Institution (24%)	51%*	74%+	77%*	17%	43%	87%	11%*
Non-Minority Serving Institution (76%)	44%	85%	76%*	15%	55%	88%+	23%



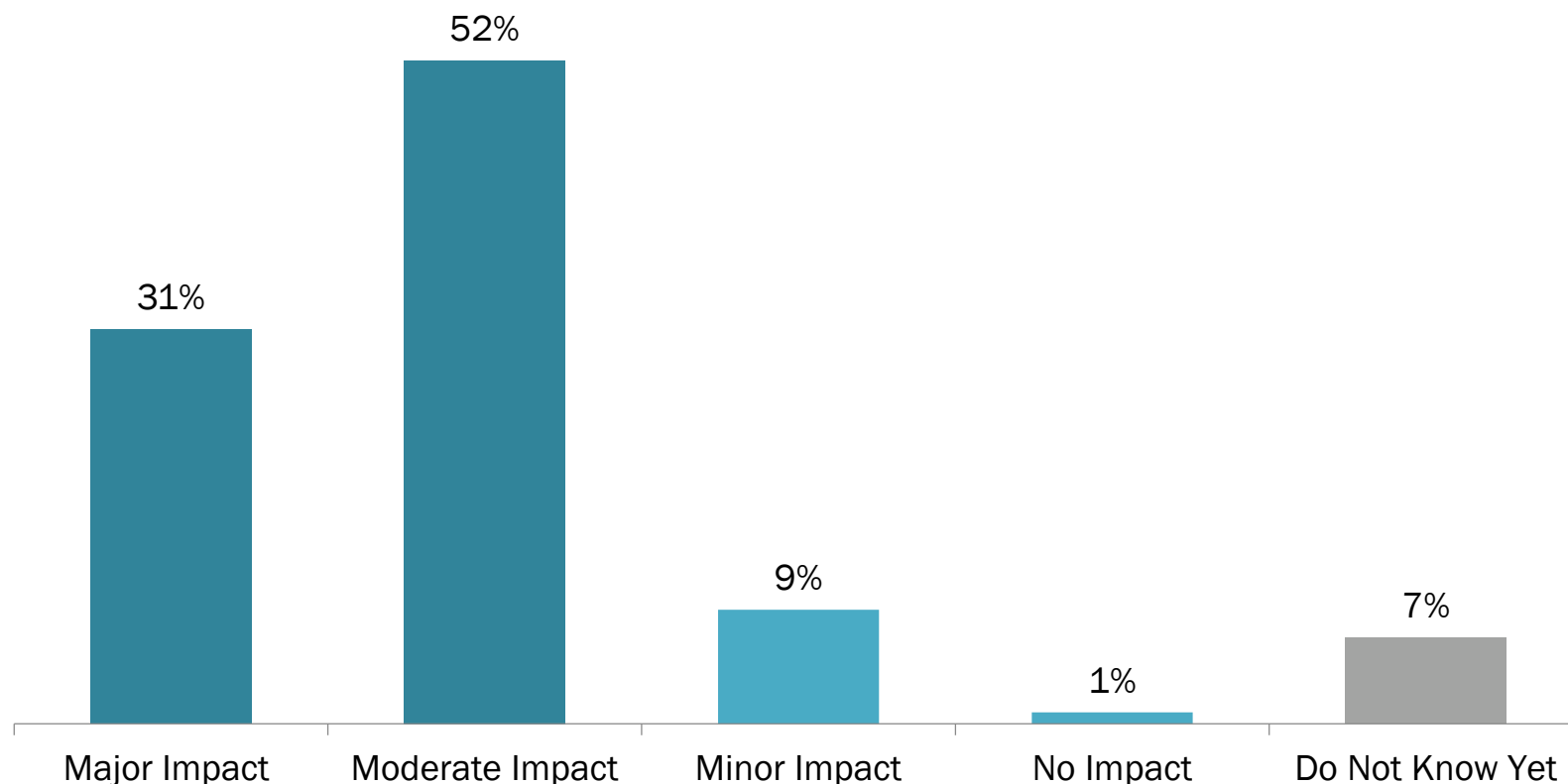
*More Negatively Impacted than Overall Average
+Less Negatively Impacted than Overall Average
On par with Overall Average



# Impact on Research Activities

Changes stemming from COVID-19 have impacted research productivity at a majority of surveyed institutions. Similar to concerns of individual researchers, research leaders also named **reduced access to on-site laboratories** as the main factor inhibiting research activities.

## Institution Research Productivity Impact – Overall (Q22)



### Key Finding

**83%** of all respondents indicated that COVID-19 had a moderate or major impact on overall research productivity at their institution.

Upon segmentation, **MSIs** were **less likely to be negatively impacted** than other institutions, whereas **special focus/other institutions** were more negatively impacted.

# Impact on Research Activities

**Reduced access to on-site laboratories** and **institutional hiring freezes** were the top factors negatively impacting research functions at top-funded institutions.

## Top 10 Factors Negatively Affecting Institution Research Functions (Q9)

62%	Reduced access to on-site laboratories
32%	Institutional hiring freezes
23%	Increased virtual meetings
22%	Shift from in-person to online classrooms
20%	Concerns about enrollment numbers
20%	Visa considerations
19%	Increased administrative responsibilities
18%	Other
14%	Lack of COVID-19 testing resources (e.g., availability of testing sites, places to analyze tests, resources to conduct tests)
12%	Increased faculty teaching requirements

### Key Finding

**Reduced access to on-site laboratories was the #1 factor to negatively impact** doctorate-granting universities with a professional school, doctorate-granting universities without a professional school, and independent research institutions.

The overall results highlight the restriction/limitation of needed physical and human capital.

**The table** above highlights the top factors that adversely affect institution research capabilities, ranked by the percentage of respondents selecting each option.

## Section 9: Financial Impacts

Sections:	Section 8	Section 8	Section 9	Section 9	Section 10	Section 10	Section 10
Key Questions	Research Functions will be Jeopardized	Moderate/Major Impacts in Research Productivity	Very/Extremely Concerned with Institution's Financial Status	Substantial Impact from Loss in Endowment	Testing Available to Anyone	Implementing COVID-19 Monitoring Measures	Providing/Expanding Facilities for Childcare
All Respondents	41%	83%	66%	15%	44%	83%	21%
Doctorate-granting University with a Professional School (53%)	49%*	85%	77%*	19%*	51%+	88%+	26%+
Doctorate-granting University without a Professional School (17%)	40%	82%	74%*	13%	58%+	90%+	-
Independent Research Institution (19%)	29%+	83%	33%+	-	31%*	81%	15%*
Special Focus/Other Institution (7%)	-	87%*	-	-	-	40%*	50%+
Minority-Serving Institution (24%)	51%*	74%+	77%*	17%	43%	87%	11%*
Non-Minority Serving Institution (76%)	44%	85%	76%*	15%	55%	88%+	23%

\*More Negatively Impacted than Overall Average

+Less Negatively Impacted than Overall Average

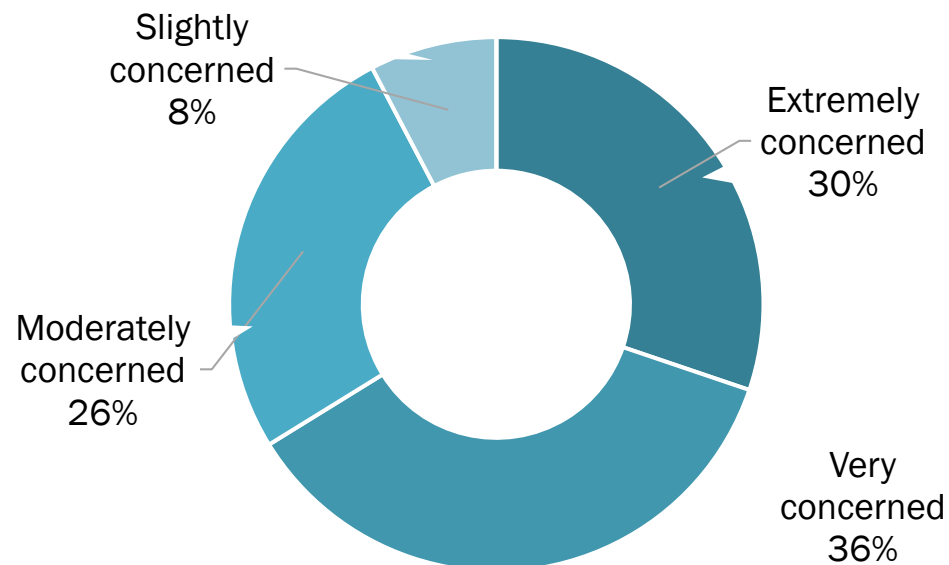
On par with Overall Average

# Impact on Financial Status

**Two in three research leaders expressed concern about their institution's financial status** following the unexpected short- and long-term costs related to COVID-19.

## Concern About the Overall Financial Impact of COVID-19

(Q10)



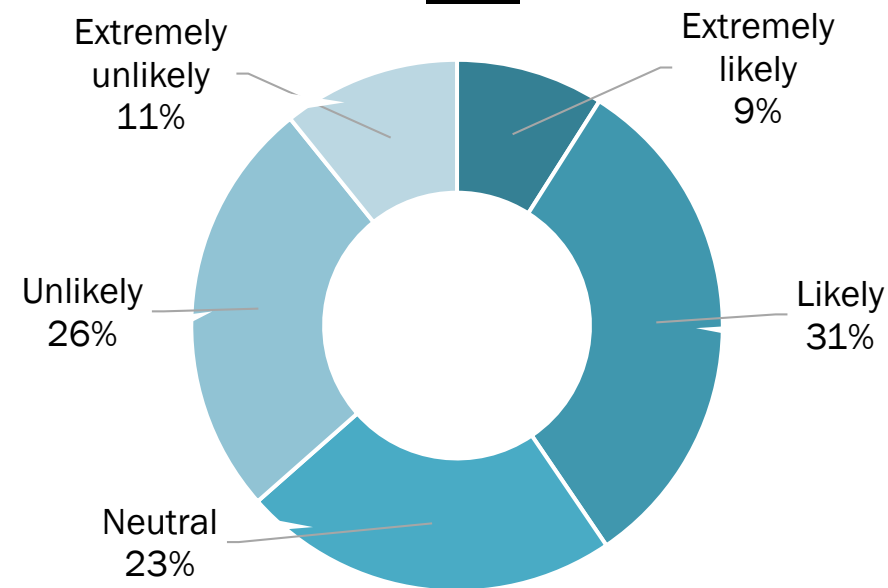
### Key Finding

Every respondent expressed some level of concern about their institution's financial status, and most **respondents were very or extremely concerned** about the pandemic's impact.

More than 50% of responses from **independent research** and **special focus/other institutions** indicated being only moderately or slightly concerned.

## Likelihood of Financial Repercussions on Research Function

(Q11)



### Key Finding

Opinions toward the likelihood of financial repercussions on institutional research functions were split. **Over one-third of research leaders said that future financial repercussions are likely or extremely likely**, and over one-third indicated that future financial repercussions are unlikely or extremely unlikely.

# Impact on Financial Status

Increased spending to **ensure the safety of staff and students** and on **technology to facilitate remote work** were the top factors substantially impacting institutions.

## Top 10 Factors Substantially Impacting Institutions (Q12)

71%	Increased expenses involved with ensuring safety of staff and students
53%	Unexpected costs associated with increased spending on technology to facilitate remote work
48%	Loss of housing and dining revenue with students leaving campus earlier than planned
43%	Reduction in tuition revenue from students
37%	Loss of revenue from activities (e.g., camps, summer programs, day cares)
34%	Decrease in philanthropic revenue sources (e.g., non-governmental revenue from fundraising, private foundation grants, etc.)
34%	Loss of state funding
25%	Loss of revenue from athletics
21%	Unexpected costs associated with staff and students moving off campus
15%	Loss of endowment funding or capital market programs

### Key Finding

Expenses involved with ensuring staff and student safety was the #1 factor cited as having a substantial impact on the institution by all four institution types: doctorate-granting with a professional school, doctorate-granting without a professional school, independent research institutions, and special focus/other institutions.

# Section 10: Mitigating Actions

Sections:	Section 8	Section 8	Section 9	Section 9	Section 10	Section 10	Section 10
Key Questions	Research Functions will be Jeopardized	Moderate/Major Impacts in Research Productivity	Very/Extremely Concerned with Institution's Financial Status	Substantial Impact from Loss in Endowment	Testing Available to Anyone	Implementing COVID-19 Monitoring Measures	Providing/Expanding Facilities for Childcare
All Respondents	41%	83%	66%	15%	44%	83%	21%
Doctorate-granting University with a Professional School (53%)	49%*	85%	77%*	19%*	51%+	88%+	26%+
Doctorate-granting University without a Professional School (17%)	40%	82%	74%*	13%	58%+	90%+	-
Independent Research Institution (19%)	29%+	83%	33%+	-	31%*	81%	15%*
Special Focus/Other Institution (7%)	-	87%*	-	-	-	40%*	50%+
Minority-Serving Institution (24%)	51%*	74%+	77%*	17%	43%	87%	11%*
Non-Minority Serving Institution (76%)	44%	85%	76%*	15%	55%	88%+	23%

\*More Negatively Impacted than Overall Average

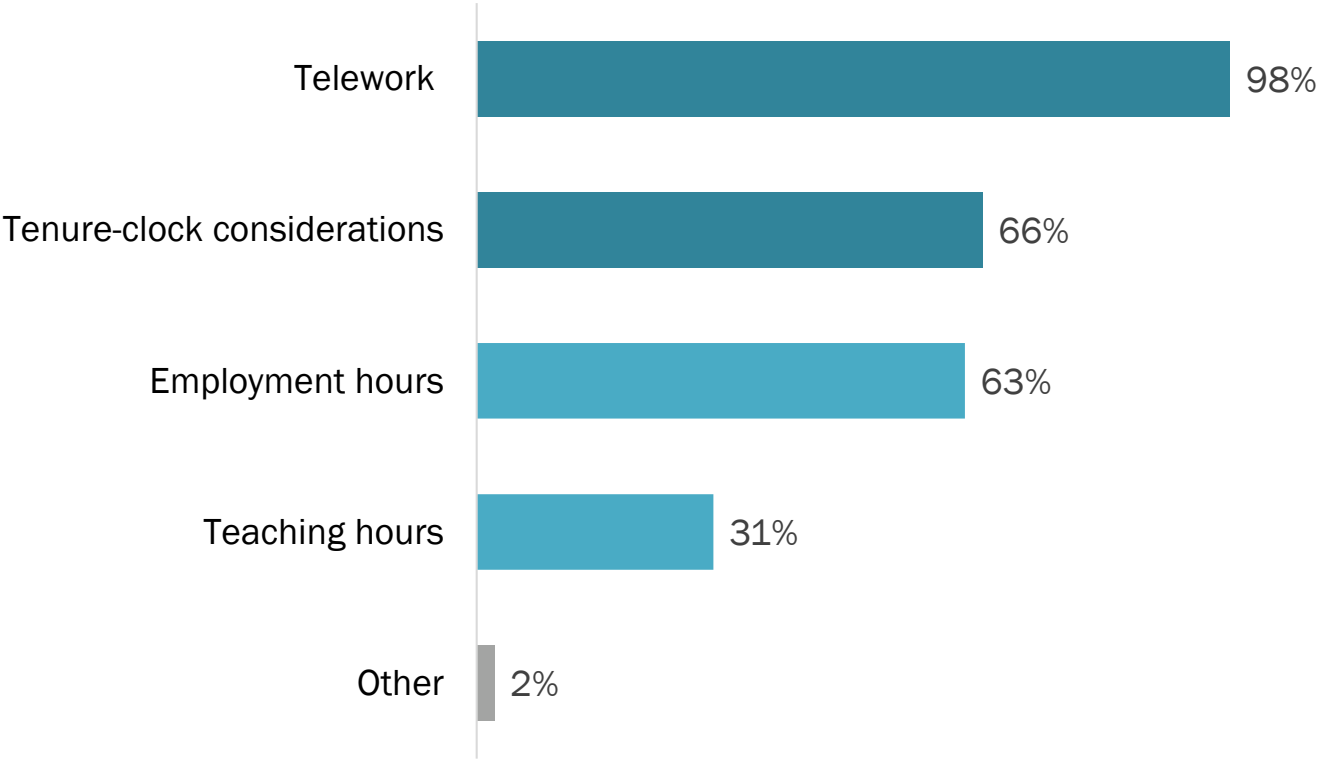
+Less Negatively Impacted than Overall Average

On par with Overall Average

# Mitigating Actions

Most research leaders reported that their institution provided workplace flexibilities, which is consistent with the finding that 79% of individual researchers reported receiving moderate-to-high levels of institutional support .

## COVID-19 Related Flexibilities for Faculty/Staff (Q57)



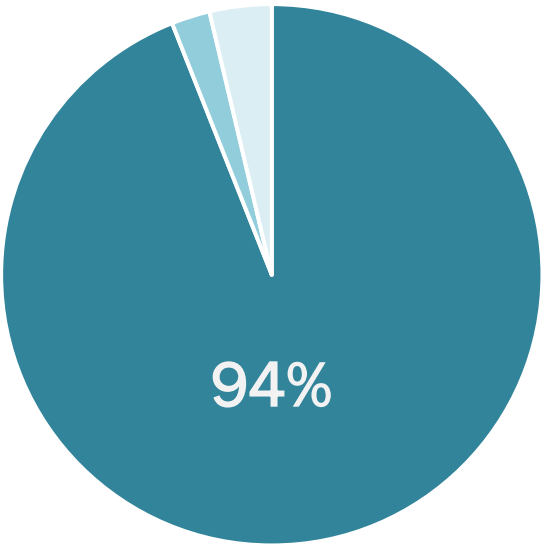
### Key Finding

Most institutions have implemented COVID-19 related flexibilities, including telework, tenure-clock considerations, and flexible employment hours.

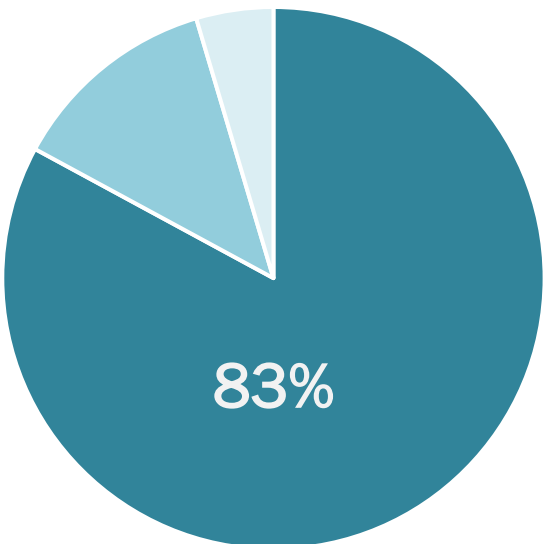
These efforts indicate that many institutions have worked to mitigate the negative effects of COVID-19 on overall institution functions and their workforce.

# Mitigating Actions

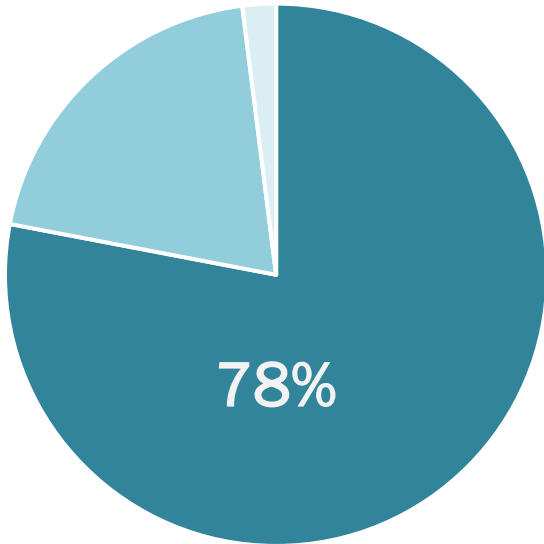
Most institutions (above 80%) **have a plan for reporting COVID-19 cases** and have **implemented monitoring measures**.



Of institutions have an organizational **plan for reporting COVID-19 cases and emerging cases** (Q56)



Of institutions **have implemented** contact tracing, transmission modeling, and other **monitoring measures** (Q55)



Of institutions **have COVID-19 testing available** for staff, faculty members, and students (Q54)



# Mitigating Actions

Implementing **communal dining restrictions** and **safe dormitory facilities** are the top two challenges institutions face as they re-open.

## Understanding Reopening Challenges - % Very Difficult/Difficult (Q61-68)

How <b>difficult</b> will the following measures be to implement as the institution re-opens?*	Physical distancing	PPE and hand sanitizing provisions	Contact tracing & tracking	Communal dining restrictions	Campus & public transportation limitations	Safe dormitory facilities and occupancy	Custodial services & sanitizing of classrooms/ lab spaces	Health care providers available for staff
All Respondents	31%	10%	27%	40%	33%	36%	20%	21%
Doctorate-granting University with a Professional School	35%	11%	33%	49%*	41%*	49%*	25%	25%
Doctorate-granting University without a Professional School	29%	-	26%	32%+	29%	34%	26%	24%
Independent Research Institution	20%+	-	12%+	20%+	12%	-	-	-

### Key Finding

**Most institutions do not anticipate enhanced difficulties when implementing initiatives to reopen**, with communal dining restrictions considered the most difficult and PPE and hand sanitizer provisions perceived as the least difficult.

*More Negatively Impacted than Overall Average
+Less Negatively Impacted than Overall Average
On par with Overall Average

**Note:** Cells with a dash indicate responses with n<5 and therefore are restricted

# Conclusions

## CAREER TRAJECTORY

Over half of the researchers surveyed believed that their **career trajectory** will be **negatively impacted by the pandemic**. The most important driver was a **negatively impacted ability to apply to grants**, followed by the pandemic negatively impacting research activities, career stage, race, and caretaking responsibilities.

## INSTITUTIONAL SUPPORT

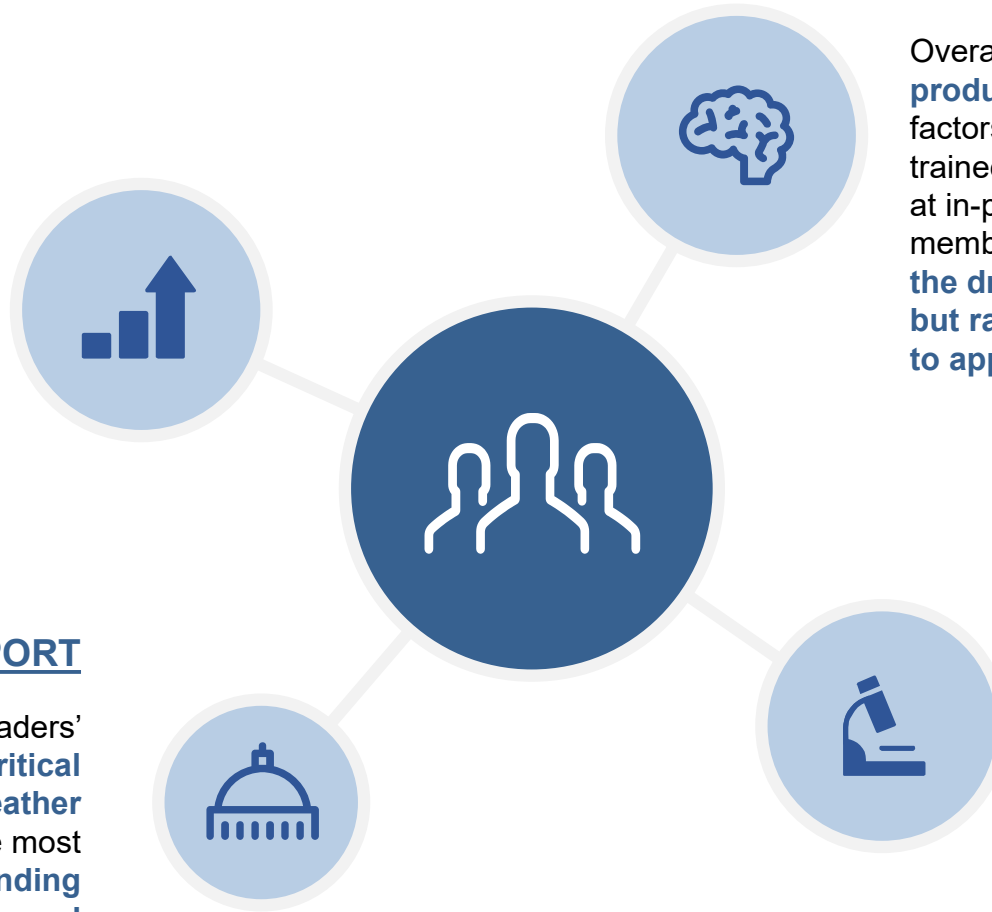
From both researchers' and research leaders' perspectives, **strong institutional support is critical in helping the research community weather disruptions** caused by the pandemic. The most effective methods of support include **bridge funding for research, reduced workload, and increased resources for childcare and mental health**.

## RESEARCH PRODUCTIVITY

Overall, most researchers reported **lower-than-normal productivity** since the pandemic began. Contributing factors include the **loss of in-person interactions** with trainees/mentors/supervisors and with other researchers at in-person conferences. While non-senior faculty members were more affected than other career stages, **the driving factors were not rooted in career stage but rather in changes in lab access, impact on ability to apply for grants, and research being put on hold**.

## MENTAL HEALTH

**External stressors** are taking a toll on researchers, with over half of the respondents indicating that **physical/social isolation and societal/political events** affected their mental health. Across professional and demographic groups, those **with an “other” gender identity**, those who **identified with two or more races**, and **Hispanic/Latino respondents** were significantly more likely to indicate that their mental health has negatively affected their productivity.



# Appendix

# Source Questions

To view the original Extramural Researchers and Extramural Institutions survey questionnaires, **double click the preview documents** below:

## Extramural Researchers Survey

Q34. Clinical research or support for clinical research activities			1	
Q35. Data analyses or computational research			1	
Q36. Information technology-related tasks or support (e.g., setting up Zoom)			1	
Q37. Laboratory or animal research or support for these activities			1	
Q38. Reading or reviewing scientific or medical papers, websites or other content			1	
Q39. Mentoring or supervising trainees or other staff			1	
Q40. Receiving mentorship or supervision			1	
Q41. Scientific or medical meeting participation (including virtual meetings)			1	
Q42. Writing research papers, review articles, grants or protocols			1	

### Impact on Career

As a result of changes in your workplace due to COVID-19, to what extent are you concerned about the following, if at all?

	Very concerned	Somewhat concerned	Not concerned	Not applicable
Q43. Losing my job or becoming under-employed				11
Q44. The impact of returning to the physical workplace on my/my family's health	-	-	-	11
Q45. The impact of COVID-19 on the longevity of my organization				11
Q46. The impact of COVID-19 on the				11

## Extramural Institutions Survey

### Impact of COVID-19 on Extramural Institutions Institutional-Level Questionnaire

#### The NIH COVID-19 Impact on Extramural Institutions Survey

Thank you for participating in the NIH Extramural Institutions COVID-19 Impact Survey. Administered by NIH's Office of Scientific Workforce Diversity, results from the survey will help NIH leadership understand how NIH funded institutions have been affected by the COVID-19 pandemic and inform NIH policies and programs.

Before beginning, please review the important information below and hit agree at the bottom of this page.

**Confidentiality:** Your responses to the survey are confidential and anonymous. An independent outside entity has been contracted by the NIH to distribute the survey, collect responses, and present survey findings back to NIH in groups no smaller than 5.

#### Before You Begin

- Taking the survey is voluntary. You may opt out at any time by closing the web-page.
- For your responses to be assessed, you will need to click the "submit" button on the last page of the survey.
- You do not need to answer all the questions to submit your responses.

#### Contacts:

For general questions or technical issues about how to complete the survey, please email [ericvane@deloitte.com](mailto:ericvane@deloitte.com).

If you'd like to learn more about the survey background and objectives, please email the NIH Scientific Workforce Diversity Office at [WorkClimate@od.nih.gov](mailto:WorkClimate@od.nih.gov).

You can take this survey at your convenience on your mobile device or computer. We need a strong response rate to understand how we can address challenges posed by the COVID-19 pandemic. The survey will close on Oct 23, 2020.

Thank you!

# Combined Categories and Recodes

## MSI Institutions

**MSI Institution:** MSIs are institutions of higher education that serve minority populations. There are seven categories of MSI defined in US law under Title III of the Higher Education Act of 1965 <sup>1</sup>:

1. Historically Black Colleges and Universities
2. Predominantly Black Institutions
3. Hispanic-Serving Institutions
4. Tribal Colleges or Universities
5. Native American Non-Tribal Institutions
6. Alaskan Native- or Native Hawaiian-Serving Institutions
7. Asian American- and Native American Pacific Islander-Serving Institutions

## Demographics

**Other (in the context of race):** This includes the answer choices American Indian or Alaska Native, Native Hawaiian or Pacific Islander, and Other

**Other (in the context of gender):** This includes the answer choices Transgender man, Transgender woman, Genderqueer or gender non-conforming, Questioning, and Something else

## Career Stage

We distinguish between **Early-** and **Senior-Career Investigators**. The former includes graduate students and researchers with a full-time, independent research appointment from 0 to 7 years.<sup>2,3</sup> **Mid-career** spans 7 to 14 years, and consequently **senior-career** comprises those with 15+ years.<sup>4</sup> They are based on Q6, Q6a, and Q6b.

### Early-career Investigators:

- Graduate student (non-medical)
- Postdoctoral fellow
- Faculty: 0-6 years after residency/postdoc
- Researcher: 0-6 years after residency/postdoc/last advanced degree (no postdoc)

### Mid-Career Investigators:

- Faculty: 7-14 years after residency/postdoc
- Researcher: 7-14 years after residency/postdoc/last advanced degree (no postdoc)

### Senior Career Investigators:

- Faculty: 15+ years after residency/last postdoc
- Researcher: 15+ years after residency/postdoc/last advanced degree (no postdoc)

1. Source: U.S. Department of Education <https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>  
2. Source: IRIS (2020). Early-career Investigators Resource Page. Retrieved from [https://www.iris.edu/hq/eci#:~:text=Early%20Career%20Investigators%20\(ECIs\)%20are,students%20through%20pre%2Dtenure%20faculty.&text=Our%20mission%20is%20to%20organize,jobs%20in%20industry%20or%20academia](https://www.iris.edu/hq/eci#:~:text=Early%20Career%20Investigators%20(ECIs)%20are,students%20through%20pre%2Dtenure%20faculty.&text=Our%20mission%20is%20to%20organize,jobs%20in%20industry%20or%20academia)  
3. Source: CIHR (2020). Supporting early-career researchers affected by COVID-19: Temporarily "pausing the clock" for ECRs. Retrieved from <https://cihr-irsc.gc.ca/e/52132.html>  
4. Source: Univ. of Kent (2015). Mid Career Researchers. Retrieved from <https://www.kent.ac.uk/researcherdevelopment/career-paths/mid-career.htm>

# How to Interpret Generalized Boosting Results – Importance Scores

**What is Generalized Boosting?** Generalized boosting is an ensemble learning methods for classification, regression, or other tasks that operate by constructing a multitude of decision trees and outputting the class that is the mode prediction of the individual trees. (For example, a generalized boosted model consists of 10 decision trees. Each tree predicts whether an observation belongs to the positive or negative class. If the "threshold" is set at 60%, then at least 7 out of 10 decision trees must predict that the record belongs in the positive class for it to be classified as such.) To perform our analysis, we used the Generalized Boosted Regression Models package. This approach implements the exponential loss function AdaBoost algorithm and the gradient descent algorithm from Friedman's gradient boosting machine.

**What is Feature Importance?** Feature Importance provides insight to how much each feature, or independent variable, contributes to separating one outcome, e.g., "decreased research productivity" class from another, e.g. "no change, or improved research productivity" class.

	Top 10 Variables	Importance
1	Q47. Impact on Grant Application Ability	41.0
2	Q28. COVID-19 Negatively Impacting Research-Related Activities	13.8
3	Q6, 6a, 6b. Career Stage	8.5
4	Q96. Race	5.1
5	Q20. Caretaking Impact on Difficulty to Complete Work	3.4
6	Q7/Q8. Primary Type of Research	2.8
7	Q26. Negative Impact on Productivity: Personal Mental/Physical Health Negatively Impacting Productivity	2.3
8	Q59. Organization is Effectively Managing the Impact of COVID-19	2.3
9	Q99. Marital Status	2.0
10	Q24. Lost Access to Expertise	1.9

## What do these numbers mean?

- First, the model determines which independent variables do the best job of separating the positive class from the negative class, as measured by a statistic called the "Gini coefficient"
- The higher the importance score, the better the variable is at classifying relative to the other variables in the model
- The table to the left displays only the top 10 variables from the "Career Trajectory Model", found on slide 22

# How Missing Values are Handled

## A Hybrid Approach

- Our approach to missing values is centered on the **data generating mechanism** behind the missing values, or the **relationship between missingness** and the **observed variables** (Rubin 1976).
- Features that are **Missing not at Random (MNAR)** indicate that the missingness is not a function of observed values but rather exogenous factors.
- For data MNAR, we treated the missing values as another predictor (see e.g., Josse et. al, 2020).
- We applied this approach for those variables that were less opinion-based and more “structural” in nature:
  - Race
  - Ethnicity
  - Disability
  - Marital Status
  - Gender Identity
  - Caretaking Status
- We **imputed the missing values for the remaining variables** in the model.

**Sources:** Josse, J., Prost N., Scornet E., Varoquaux, G. (2020) On the consistency of supervised learning with missing values. 2020.  
Rubin, D. B. (1976) Inference and Missing Data. *Biometrika*, 63(3):581–592, 1976.

# Career Trajectory – Generalized Boosting Results: Black/AA Sample

**Impact on Ability to Apply for Grants** and **Marital Status** are the two strongest predictors of negative perception of career trajectory as a result of COVID-19 on the Black/African American sample.

Top 10 Variables	Importance
<b>Q47. Impact on Grant Application Ability</b>	<b>16.7</b>
<b>Q99. Marital Status</b>	<b>6.97</b>
<b>Q7/Q8. Primary Type of Research</b>	<b>6.9</b>
Q28. COVID-19 Negatively Impacting Research-Related Activities	4.9
Q20. Caretaking Impact on Difficulty to Complete Work	4.0
Q23. At Risk Status of Severe COVID-19 Illness in the Household	3.8
Q6, 6a, 6b. Career Stage	3.1
Q24. Lost Access to Expertise	2.6
Q24. Lost Access to Specialized Equipment	2.4
Q10. Employment Status Impacted by COVID-19	2.3

The table above contains the independent variables that hold the **most predictive power** when trying to predict African American respondents' level of agreement to the **statement in Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 78.7.



# Career Trajectory – Generalized Boosting Results: Asian Sample

**Negatively Impacted Research-Related Activities** and **Impact on Ability to Apply for Grants** are the two strongest predictors of negative perception of career trajectory as a result of COVID-19 on the Asian sample.

Top 10 Variables	Importance
Q28. COVID-19 Negatively Impacting Research-Related Activities	21.5
Q47. Impact on Grant Application Ability	13.3
Q7/Q8. Primary Type of Research	8.2
Q6, 6a, 6b. Career Stage	6.5
Q16. Caretaker Status	5.8
Q99. Marital Status	3.6
Q20. Caretaking Impact on Difficulty to Complete Work	2.6
Q23. At Risk Status of Severe COVID-19 Illness in the Household	2.4
Q26. Negative Impact on Productivity: Visa Considerations	2.1
Q97. Gender	2.0

The table above contains the independent variables that hold the **most predictive power** when trying to predict Asian respondents' level of agreement to the **statement in Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 79.4.

# Career Trajectory – Generalized Boosting Results: Hispanic Sample

**Negatively Impacted Research-Related Activities** and **Impact on Ability to Apply for Grants** are the two strongest predictors of negative perception of career trajectory as a result of COVID-19 on the Hispanic sample.

Top 10 Variables	Importance
<b>Q28. COVID-19 Negatively Impacting Research-Related Activities</b>	<b>22.3</b>
<b>Q47. Impact on Grant Application Ability</b>	<b>13.7</b>
<b>Q7/Q8. Primary Type of Research</b>	<b>11.1</b>
Q99. Marital Status	4.7
Q6, 6a, 6b. Career Stage	4.3
Q20. Caretaking Impact on Difficulty to Complete Work	3.0
Q24. Lost Access to Collaborators	2.4
Q23. At Risk Status of Severe COVID-19 Illness in the Household	2.1
Q24. Lost Access to Expertise	2.0
Q10. Employment Status Impacted by COVID-19	1.8

The table above contains the independent variables that hold the **most predictive power** when trying to predict Hispanic respondents' level of agreement to the **statement in Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 80.2.

# Career Trajectory – Generalized Boosting Results: Women

**Negatively Impacted Research-Related Activities** and **Impact on Ability to Apply for Grants** are the two strongest predictors of negative perception of career trajectory as a result of COVID-19 on the Women sample.

Top 10 Variables	Importance
Q28. COVID-19 Negatively Impacting Research-Related Activities	20.6
Q47. Impact on Grant Application Ability	17.7
Q6, 6a, 6b. Career Stage	9.2
Q7/Q8. Primary Type of Research	5.6
Q20. Caretaking Impact on Difficulty to Complete Work	5.1
Q96. Race	4.5
Q59. Organization is Effectively Managing the Impact of COVID-19	4.1
Q99. Marital Status	3.5
Q24. Lost Access to Expertise	2.4

The table above contains the independent variables that hold the **most predictive power** when trying to predict women respondents’ level of agreement to the **statement in Q50 – “The pandemic will probably have a negative impact on my career trajectory.”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 81.6.

# Research Productivity– Generalized Boosting Results: Black/AA Sample

**Impact on Ability to Apply for Grants** and **Primary Type of Research** are the two strongest predictors of decreased research productivity as a result of COVID-19 on the Black/African American sample.

Top 10 Variables	Importance
Q47. Impact on Grant Application Ability	11.6
Q7/Q8. Primary Type of Research	6.5
Q26. Negative Impact on Productivity: Research Put on Hold	6.2
Q99. Marital Status	4.4
Q26. Negative Impact on Productivity: Changes in Laboratory/Animal Facility Access	3.6
Q24. I Have Not Lost Access to Research Resources	3.3
Q26. Negative Impact on Productivity: Uncertainty About Timeline for Return To Workplace	3.2
Q26. Negative Impact on Productivity: Virtual Instead of In-person Interactions with Trainees, Mentors, or Supervisors	2.8
Q26. Negative Impact on Productivity: Changes in Life Priorities or in Work-life Balance	2.7
Q26. Negative Impact on Productivity: Cancellation of In-person Conferences	2.6

The table above contains the independent variables that hold the **most predictive power** when trying to predict African American respondents' level of agreement to the **statement in Q25 – “How would you rate your research productivity during the pandemic?”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 80.7.

# Research Productivity – Generalized Boosting Results: Asian Sample

**Not having Lost Access to Research Resources** and **Primary Type of Research** are the two strongest predictors of research productivity as a result of COVID-19 on the Asian sample.

Top 10 Variables	Importance
<b>Q24. I Have Not Lost Access to Research Resources</b>	<b>10.3</b>
<b>Q7/Q8. Primary Type of Research</b>	<b>9.3</b>
<b>Q26. Negative Impact on Productivity: Changes in Laboratory/Animal Facility Access</b>	<b>8.1</b>
Q47. Impact on Grant Application Ability	8.0
Q26. Negative Impact on Productivity: Research Put on Hold	4.8
Q26. Negative Impact on Productivity: Uncertainty About Timeline for Return To Workplace	4.5
Q16. Caretaker Status	3.8
Q99. Marital Status	3.6
Q24. Lost Access to Facilities/Lab Spaces	3.4
Q26. Negative Impact on Productivity: Changes in Life Priorities or in Work-life Balance	3.2

The table above contains the independent variables that hold the **most predictive power** when trying to predict Asian respondents' level of agreement to the **statement in Q25 – “How would you rate your research productivity during the pandemic?”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 83.8.

# Research Productivity– Generalized Boosting Results: Hispanic Sample

**Primary Type of Research** and **Research Put on Hold** are the two strongest predictors of decreased research productivity as a result of COVID-19 on the Hispanic sample.

Top 10 Variables	Importance
Q7/Q8. Primary Type of Research	8.2
Q26. Negative Impact on Productivity: Research Put on Hold	5.7
Q26. Negative Impact on Productivity: Changes in Laboratory/Animal Facility Access	5.7
Q26. Negative Impact on Productivity: Virtual Instead of In-person Interactions with Trainees, Mentors, or Supervisors	4.9
Q47. Impact on Grant Application Ability	4.6
Q24. I Have Not Lost Access to Research Resources	4.2
Q20. Caretaking Impact on Difficulty Completing Work Responsibilities	3.6
Q26. Negative Impact on Productivity: Uncertainty About Timeline for Return To Workplace	3.2
Q26. Negative Impact on Productivity: Personal Mental/Physical Health	2.9
Q24. Lost Access to Facilities/Lab Spaces	2.8

The table above contains the independent variables that hold the **most predictive power** when trying to predict Hispanic respondents' level of agreement to the **statement in Q25 – “How would you rate your research productivity during the pandemic?”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 83.8.

# Research Productivity– Generalized Boosting Results: Women

**Changes in Lab Facility Access** and **Impact on Ability to Apply for Grants** are the two strongest predictors of decreased research productivity as a result of COVID-19 on the Women sample.

Top 10 Variables	Importance
<b>Q26. Negative Impact on Productivity: Changes in Laboratory/Animal Facility Access</b>	<b>11.3</b>
<b>Q47. Impact on Grant Application Ability</b>	<b>10.9</b>
<b>Q7/Q8. Primary Type of Research</b>	<b>10.4</b>
Q26. Negative Impact on Productivity: Research Put on Hold	8.1
Q20. Caretaking Impact on Difficulty Completing Work Responsibilities	5.2
Q24. I Have Not Lost Access to Research Resources	4.7
Q24. Lost Access to Facilities/Lab Spaces	3.8
Q26. Negative Impact on Productivity: Changes in Life Priorities or in Work-life Balance	3.6
Q26. Negative Impact on Productivity: Teleworking	3.2
Q26. Negative Impact on Productivity: Virtual Instead of In-person Interactions with Trainees, Mentors, or Supervisors	3.1

The table above contains the independent variables that hold the **most predictive power** when trying to predict women respondents' level of agreement to the **statement in Q25 – “How would you rate your research productivity during the pandemic?”**

**Note:** A total of 48 relevant independent variables were analyzed. The model was trained on a randomly selected sample (80%) of respondents and tested on a smaller random sample (20%) of respondents held out from the training data. The AUC score on test data was 82.9.